

Work Plan Supplement

EPA Region 5 Records Ctr.



280301

Remedial Investigation/ Feasibility Study

Crab Orchard National Wildlife Refuge

U.S. Fish and Wildlife Service
U.S. Department of Interior
Marion, Illinois
and
Sangamo-Weston, Inc.
Atlanta, Georgia

December 1985



O'BRIEN & GERE

REPORT

WORK PLAN SUPPLEMENT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
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DECEMBER, 1985

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WORK PLAN SUPPLEMENT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

This Supplement to the Work Plan has been prepared to provide additional explanation for various aspects of the Work Plan prepared for the Remedial Investigation/Feasibility Study (RI/FS) for the Crab Orchard National Wildlife Refuge. Several minor corrections to the Work Plan also are included. Additions and other changes are discussed under the relevant headings of the original Work Plan.

SUPPLEMENT TO WORK PLAN - INTRODUCTION

Figure 1 of the Original Work Plan is amended by substituting Attachment S-1. Sampling Site 8 was omitted from the earlier figure and has now been added. In addition, the new Site 35 (see page 5 of the July 31, 1985 Status Report) has been added to Attachment S-1.

A new Attachment S-2 has also been incorporated into this Supplement to the Work Plan. Attachment S-2 shows the boundaries of the entire Refuge and the locations of the study Site Groups within the overall Refuge.

SUPPLEMENT TO WORK PLAN TASK 1 - DESCRIPTION OF CURRENT
SITUATION

A review of available background information and data was conducted in March 1985 prior to development of the original Work Plan. This review covered many of the references which are cited in Attachment 2 of the original Work Plan as well as letters and memoranda which

are part of the public records. This document, titled "Review of Available Information, Crab Orchard National Wildlife Refuge", is included in this Work Plan Supplement as Attachment S-7. It covers geographic, historic and hydrogeologic summary information, summaries of previous analytical data, and discussions of the proposed sampling programs. (Much of this information also will be included within the Remedial Investigation Report (Task 6)).

SUPPLEMENT TO WORK PLAN TASK 3 - SITE INVESTIGATIONS

Rationale for Sampling and Analysis Plans for Each Site

The specific sampling and analysis rationale which was used for selection of each sample taken at the Refuge (including depth, location and compositing details) and the rationale for the analytical parameters selected for those samples is itemized on Attachment S-4. The specific Rationale Factors cited in Attachment S-4 are defined and discussed in detail in Attachment S-3. Similar logic was employed in selecting sampling details for many of the sites; therefore, this logic is presented as "rationale factors" defined in Attachment S-3 to avoid restating the same rationale for a multitude of sites. Additional discussion of the general sampling rationale is presented below.

Historic background information on each study site has been provided by the Refuge Manager and is summarized for each study site in Attachment 1 to Appendix B of the original Work Plan. This brief background formed the basis for selection of sites by the Refuge Manager for inclusion in the RI/FS program. This background information in some cases suggested the types of

contaminants which might be present at the site, based on the knowledge of operations which may have contributed to the contamination. In other cases, the background information available is insufficient to narrow down the potential contaminants of concern. For example, at Site 19 it was reported that "chemicals were poured out...in the field." In these cases it is necessary to develop an analytical strategy to screen for a broad range of compounds to determine those of concern.

Field observations generally formed the basis for selecting specific sampling locations and compositing intervals. These relevant field observations included the general topography and drainage patterns, geologic features, areas of unusual soil or sediment discoloration, stressed vegetative features, or evidence of scattered, mounded or buried debris. The most significant field observations were discussed in the text for each sampling site in Attachment 1 of Appendix B of the original Work Plan. That information is supplemented herein by field sketches prepared during the initial site visits during the period of March 26 through 28, 1985 (see Attachment S-8, Field Reconnaissance Sketches), to illustrate other minor features which also played a role in the selection of specific sampling locations.

Rationale for Selection of Control Sites

Three control sites are established in the Work Plan. Two of these, Sites 30 and 31, are control sites for soil and groundwater analyses. The third control site is a "lake control" incorporated into the Site 34 (Crab Orchard Lake) sampling program.

The Refuge Control, Site 31 (see original Work Plan, Appendix B, page III-35), is established in an area remote from any past industrial activities and adjacent to the Refuge Headquarters. According to the Refuge Manager, previous analyses of groundwater near the Refuge Headquarters did not show the presence of substances of concern. Sites 22 and 29, which are located north of the Refuge control, are expected to drain west and east, respectively, of the Refuge Control.

The Munition Control, Site 30 (see original Work Plan, Appendix B, page III-34), was established for several reasons:

- (1) Previous experience of O'Brien & Gere at Department of Defense munitions handling facilities showed slight background levels of explosives residuals near bunker storage facilities remote from other handling activities. This control site was established to determine if there is a similar dispersed presence of explosives residuals at this facility.
- (2) The geology south of Crab Orchard Lake is significantly different from that north of the Lake. The area now occupied by Crab Orchard Lake represents the approximate boundary of glacial advancement during the glacial epoch.

The Lake Control as a part of Site 34 (see original Work Plan, Appendix B, page III-45) is located within the western end of the Lake. Previous samplings of biota and sediments have indicated contaminant concentrations very low to undetectable in this region of the Lake.

Rationale for Design of Analysis Sets

The rationale for selection of Analysis Sets is further clarified on Attachment S-3. In addition, the following summary table illustrates the major purpose of each Analysis set and lists the sites where each is applies.

| <u>Anal. Set</u> | <u>Sites Applied</u> | <u>Purpose</u> |
|------------------|-----------------------|---|
| A | All | Screens for presence of toxic organics and quantities all other parameters but PCDF/PCDD. |
| B | Area 9 | Quantifies only PCB concentrations. |
| C | Area 9 LF Cores | Determine spatial distribution of PCB's and PCDF/PCDD in landfill in addition to other soil Characteristics. |
| D | All | Screens for presence of toxic organics and PCDF/PCDD in landfill in addition to other soil parameters. |
| E | Lake | Quantifies constituents subject to primary and secondary drinking water standards. |
| F | All | Verifies and quantifies toxic organics in samples screened by Set A. |
| G | All | Verifies and quantifies toxic organics and PCDF/PCDD in samples screened by Set A or set D. |
| H | Area 9 | Quantifies toxic organics and PCDF/PCDD in samples which were not previously screened; other soil characteristics as defined for Set D. |

Because of the high costs associated with U.S. EPA Contract Laboratory Procedure (CLP) organic analyses, the Phase I sampling program relies on a program of screening to determine those samples which should be subsequently analyzed by the full CLP protocol. See page 11 of Appendix A (Quality Assurance Project Plan) to the Work Plan. This allows sites to be screened

over a wide area for locations of concern and allows a broad chemical characterization in a cost-effective manner. A different rationale is applied to Phase II as discussed below.

PCBs have previously been determined to be present at a number of sites on the Refuge. PCDFs and PCDDs have also been analyzed for at a number of locations, although it is not known whether they are elevated due to burning of PCB articles. DOI has requested that PCDF/PCDD analyses be included at a number of sampling sites. Because of the expense associated with this analysis, the analytical program attempts to limit the number of samples for PCDF/PCDD analysis. The sampling matrix in the Work Plan includes at least one PCDF/PCDD analysis at each site where organics or PCBs are anticipated to be present. The final selection of sites for PCDF/PCDD analyses during Phase I (see discussion of Phase I and Phase II, below) is to be determined prior to the Phase I (d) effort, after the screening analyses have been completed. The final selection of sites for PCDF/PCDD analyses has now been completed and is indicated on Attachment S-4. This table thus represents a modification to the original Work Plan. Analysis sets C and D include PCDF/PCDD screening. Analysis sets G and H include the full protocol analytical procedure for PCDF/PCDD.

PCDF/PCDD screening

Phase I/Phase II

The Phase I/Phase II sampling and analytical rationale was explained in the Work Plan. See pages 7 through 13 and Table 3 of the Work Plan. In short, the purpose of Phase I is to deter-

mine if potential problems exist on a given site and to define the range of chemical compounds which contribute to the problem. The purpose of Phase II is to define the extent of contamination (both laterally and vertically) so that remedial options may be evaluated. For many of the sites on the Refuge, the Phase I effort is analogous to an EPA FIT (Field Investigation Team) evaluation, which normally precedes an RI/FS.

The Site Sampling Plan for water, sediments and biota in Crab Orchard Lake, Site 34 (see Appendix B, page III-46), states that Phase II analyses will include only those parameters found at concentrations of significance at any other site. U.S. EPA has objected to this rationale. Therefore, it was agreed that one or two samples of each matrix from Site 34 will be subjected to the full suite of Set G parameters. The Work Plan is therefore amended by Attachment S-4 to include this change.

In addition, U.S. EPA had requested a copy of the Site Operations Plan for Phase II activities including specifications and rationale for sampling locations, types, depths and analyses. The Work Plan is therefore amended to clarify that this will be provided.

Site Operations Plan

A site Operations Plan is provided in this Work Plan Supplement as Attachment S-5.

Data Management Plan

A Data Management Plan is provided in this Work Plan Supplement as Attachment S-6.

TASK 5 - SITE INVESTIGATION ANALYSIS

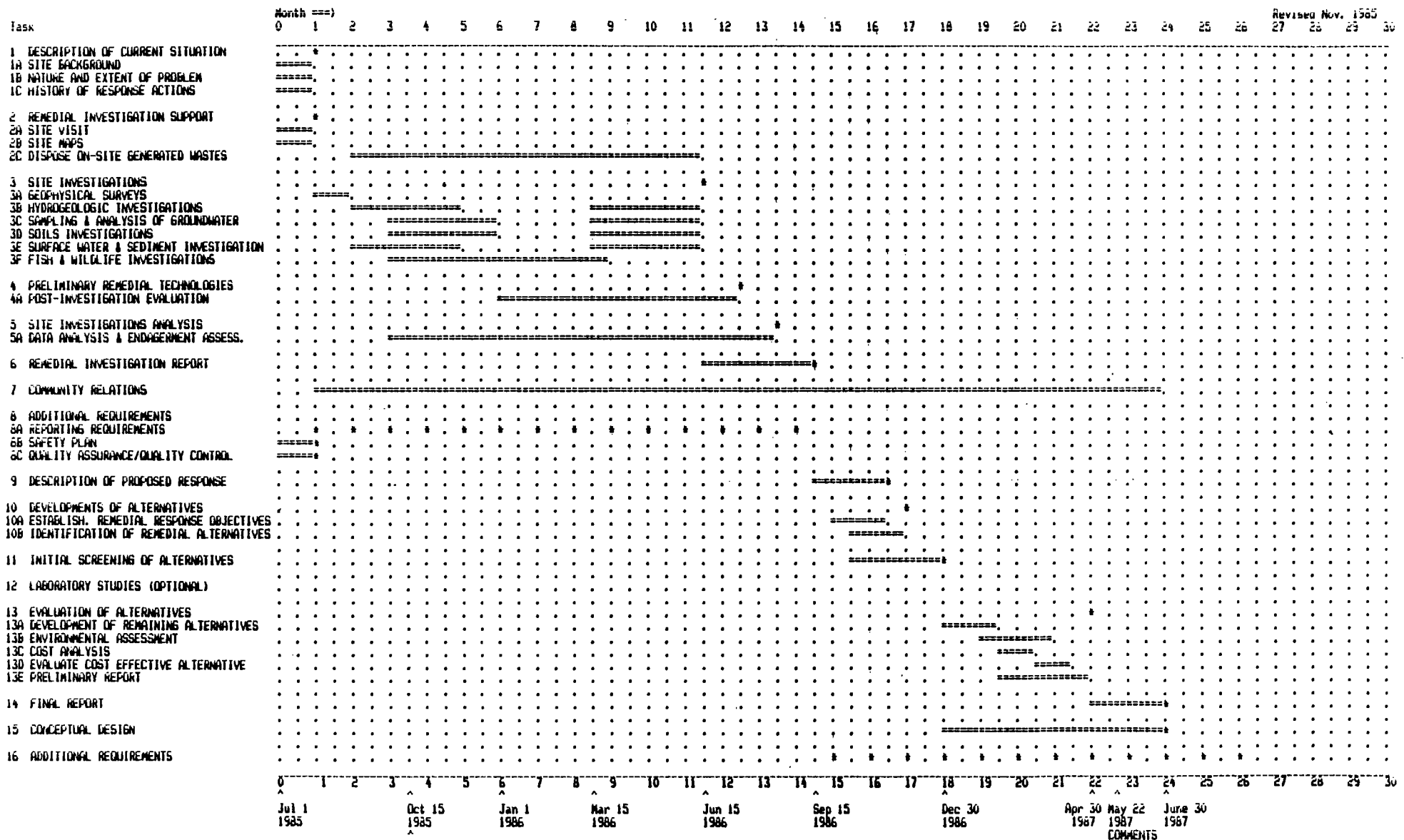
The wording of the final paragraph under Task 5, page 15 of the original Work Plan should be revised to read as follows:

"A technical memorandum will be prepared by O'Brien & Gere summarizing the hazard evaluation process and presenting the results of the hazard assessment.

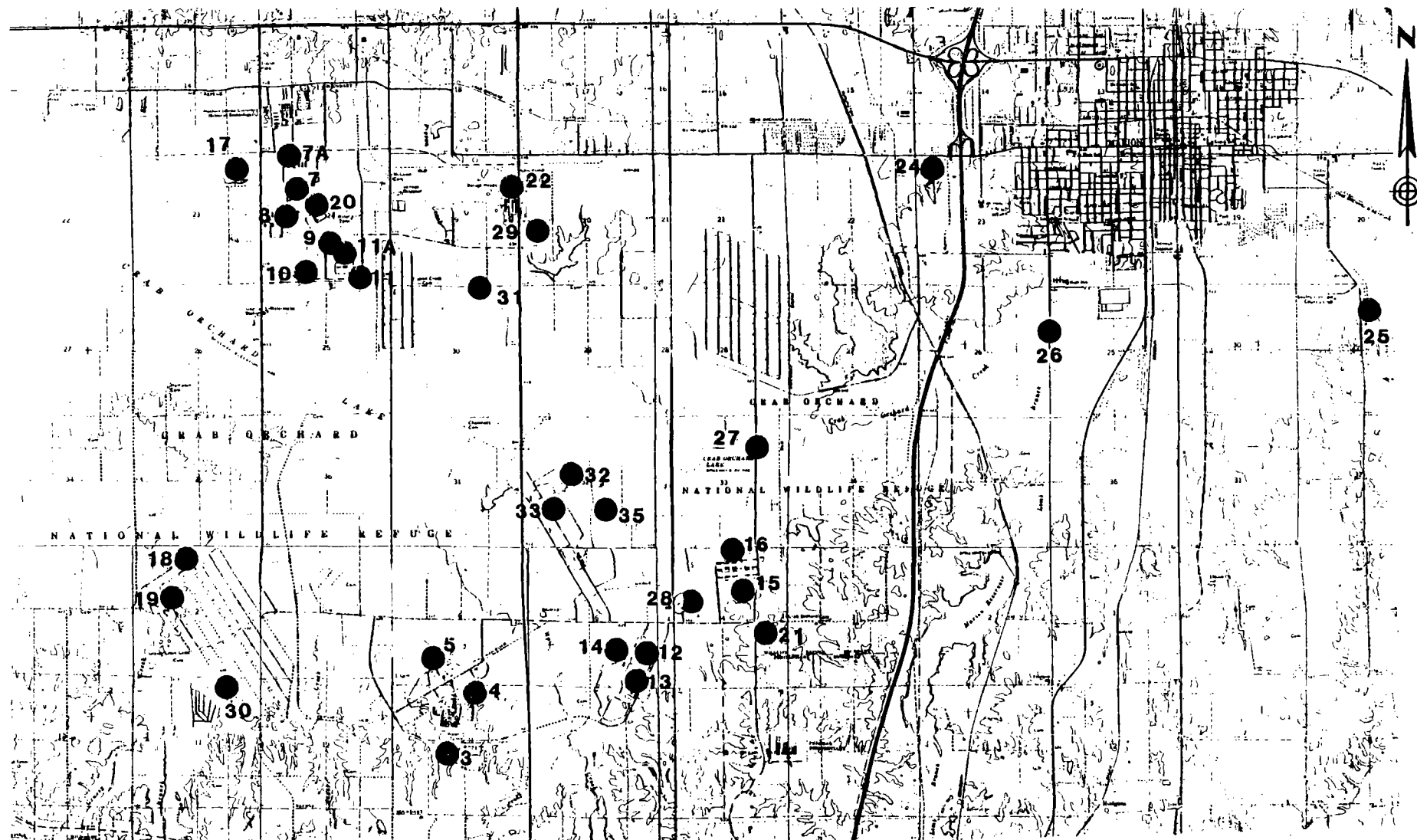
FIGURE 1

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Revised Project Schedule



ATTACHMENT S-1



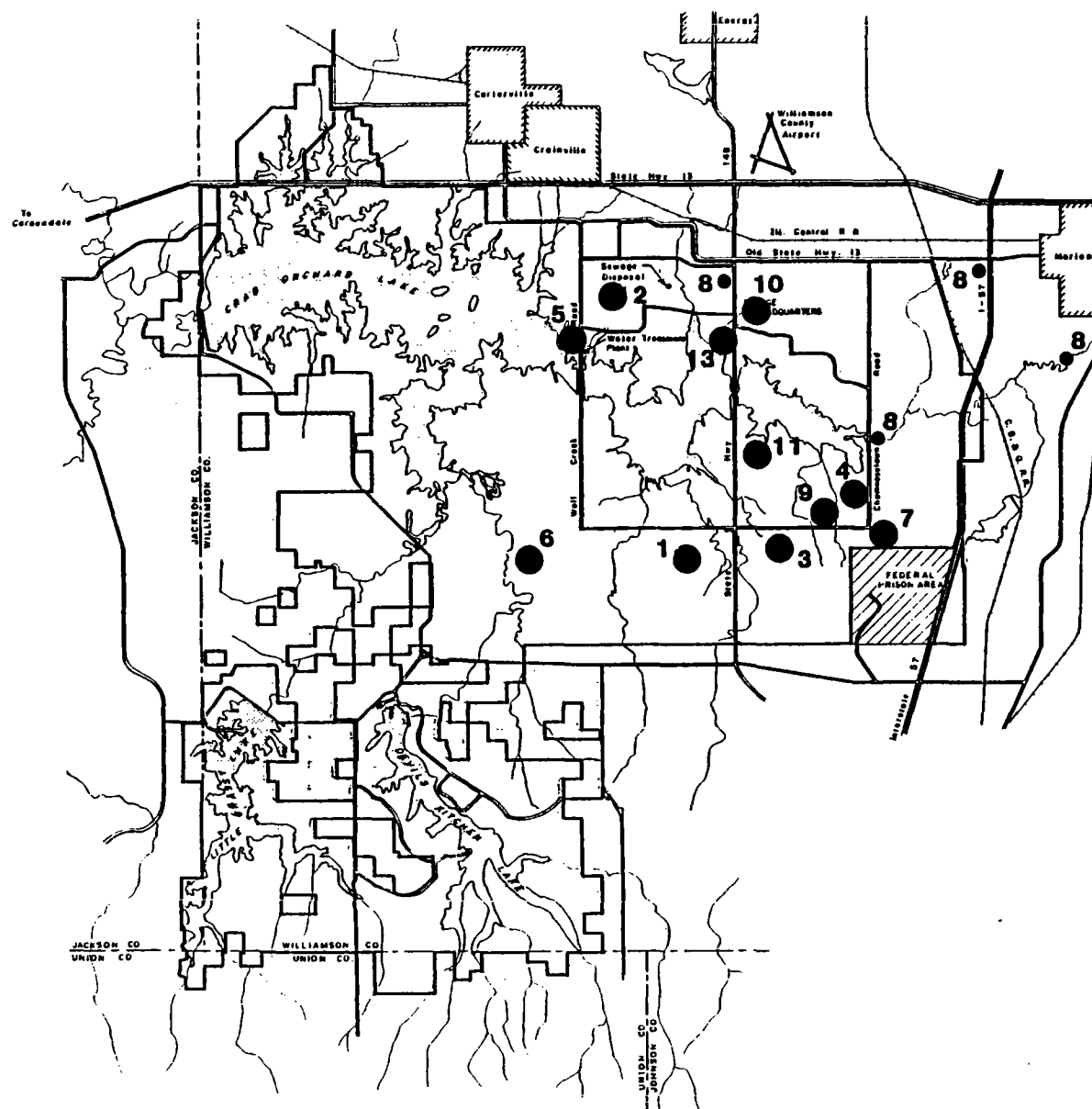
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

LOCATIONS OF SAMPLING SITES

Scale: 1" = 4000'

ATTACHMENT S-2

STUDY SITE GROUPS



LEGEND

HIGHWAYS:

4 LANE PAVED

2 LANE PAVED

GRAVEL ROAD

RAILROAD

LAKE

CITY or TOWN

COUNTY LINE

REFUGE BOUNDARY

REFUGE MAP

SCALE 0 40 80 160 240 320 Miles
0 1/2 1 2 3 4 Miles

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS)))!
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! | TYPE | ! | DEPTH | ! ANAL | ! DEPTH | ! LOCA- | ! INTERVAL! |
|--------|-----------|--------------------------|---|-----------------|----------------|-------------|--------|---------|---------|-------------|
| | | | | | | | SET | | TION | & NO. |
| ===== | | | | | | | | | | |
| *** | #1 | 3:AREA 11 SOUTH LANDFILL | | | | | | | | |
| 3- | 1 | SOIL | | NORTH BANK | COMP. 6 GRABS | 0-1 FT | A | I | P | Y |
| 3- | 2 | SOIL | | SOUTH BANK | COMP. 6 GRABS | 0-1 FT | A | I | P | Y |
| 3- | 2 | SOIL | | SOUTH BANK | COMP. 6 GRABS | 0-1 FT | F | I | P | Y |
| 3- | 3 | SOIL | | EAST MOUND | COMP. 4 GRABS | 0-1 FT | A | I | P | W |
| 3- | 4 | SEDIMENT | | MARSH | COMP. 10 GRABS | 0-1 FT | D | K | R, S | Y |
| 3- | 5 | SEDIMENT | | LOWER STREAM | COMP. 10 GRABS | 0-1 FT | A | K | P, R, S | Y |
| *** | | 4:AREA 11 NORTH LANDFILL | | | | | | | | |
| 4- | 1 | SOIL | | BARE PATCHES | COMP. 6 GRABS | 0-1 FT | D | I | P, U | Y |
| 4- | 2 | SEDIMENT | | SWAMPY SED. | COMP. 6 GRABS | 0-1 FT | A | K | R | X |
| 4- | 2 | SEDIMENT | | SWAMPY SED. | COMP. 6 GRABS | 0-1 FT | F | K | R | X |
| *** | | 5:AREA 11 ACID POND | | | | | | | | |
| 5- | 1 | WATER | | POND WATER | COMP. 4 GRABS | SURFACE | A | N | R | Y |
| 5- | 2 | SOIL | | DEAD TREE AREA | COMP. 4 GRABS | 0-1 FT | A | K | P, R, U | Y |
| 5- | 3 | SEDIMENT | | POND SED. | COMP. 4 GRABS | 0-1 FT | A | K | R | Y |
| 5- | 3 | SEDIMENT | | POND SED. | COMP. 4 GRABS | 0-1 FT | F | K | R | Y |
| *** | #2 | 7A:D AREA NORTH LAWN | | | | | | | | |
| 7A- | 1 | SOIL | | LOW SPOTS-SURF | COMP. 8 GRABS | SURFACE | A+OVA | I | U | X |
| 7A- | 2 | SOIL | | LOW SPOTS-1 FT | COMP. 8 GRABS | 6-12 INCHES | A+OVA | M | U | X |
| 7A- | 3 | SOIL | | LOW SPOTS-2 FT | COMP. 8 GRABS | 1-2 FEET | A+OVA | M | U | X |
| 7A- | 4 | SOIL | | LOW SPOTS-3 FT | COMP. 8 GRABS | 2-3 FEET | A+OVA | M | U | X |
| 7A- | 5 | SOIL | | TRANSECT A-SURF | COMP. 3 GRABS | SURFACE | A+OVA | J | Q | X |
| 7A- | 6 | SOIL | | TRANSECT A-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA | M | Q | X |
| 7A- | 7 | SOIL | | TRANSECT A-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA | M | Q | X |
| 7A- | 8 | SOIL | | TRANSECT A-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA | M | Q | X |
| 7A- | 9 | SOIL | | TRANSECT B-SURF | COMP. 3 GRABS | SURFACE | A+OVA | J | Q | X |
| 7A- | 9 | SOIL | | TRANSECT B-SURF | COMP. 3 GRABS | SURFACE | F | M | Q | X |
| 7A- | 10 | SOIL | | TRANSECT B-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA | M | Q | X |
| 7A- | 11 | SOIL | | TRANSECT B-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA | M | Q | X |
| 7A- | 12 | SOIL | | TRANSECT B-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA | M | Q | X |
| 7A- | 13 | SOIL | | TRANSECT C-SURF | COMP. 3 GRABS | SURFACE | A+OVA | J | Q | X |
| 7A- | 14 | SOIL | | TRANSECT C-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA | M | Q | X |
| 7A- | 15 | SOIL | | TRANSECT C-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA | M | Q | X |
| 7A- | 16 | SOIL | | TRANSECT C-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA | M | Q | X |
| *** | | 11A:P AREA NORTH | | | | | | | | |
| 11A- | 1 | SEDIMENT | | WEST SWALE | COMP. 3 GRABS | 0-1 FT | A | J, K | Q, R | X |
| 11A- | 2 | SEDIMENT | | EAST SWALE | COMP. 7 GRABS | 0-1 FT | A | J, K | Q, R | X |

Y is not defined

3?

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))))!
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL SET | ! DEPTH | ! LOCA- TION | ! INTERVAL! & NO. |
|----------------------------------|-----------|----------|------------------|---------------|---------------|---------|-----------------|----------------------|
| 11A- | 3 | SEDIMENT | NORTH SWALE 1 | COMP. 6 GRABS | 0-1 FT | A | J,K | Q,R X |
| 11A- | 3 | SEDIMENT | NORTH SWALE 1 | COMP. 6 GRABS | 0-1 FT | F | J,K | Q,R X |
| 11A- | 4 | SEDIMENT | NORTH SWALE 2 | COMP. 3 GRABS | 0-1 FT | A | J,K | Q,R X |
| 11A- | 5 | SOIL | LOADING DOCK | COMP. 3 GRABS | 0-1 FT | A | J | Q W |
| 11A- | 6 | SOIL | NORTH DOOR | COMP. 2 GRABS | 0-1 FT | A | J | Q W |
| 11A- | 7 | SOIL | EAST LOAD AREA | COMP. 3 GRABS | 0-1 FT | A | J | Q W |
| 11A- | 8 | SOIL | STEAMHOUSE DOOR | COMP. 2 GRABS | 0-1 FT | A | J | Q W |
| *** 7:D AREA SOUTHEAST DRAINAGE | | | | | | | | |
| 7- | 1 | WATER | D-SE WATER | COMP. 4 GRABS | SURFACE | A | N | R W |
| 7- | 2 | SEDIMENT | D-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | A | K | R W |
| *** 8:D AREA SOUTHWEST DRAINAGE | | | | | | | | |
| 8- | 1 | WATER | D-SW WATER | COMP. 2 GRABS | SURFACE | A | N | R W |
| 8- | 2 | SEDIMENT | D-SW SEDIMENT | COMP. 4 GRABS | 0-1 FT | A | K | R W |
| *** 9:D AREA NORTHWEST DRAINAGE | | | | | | | | |
| 9- | 1 | WATER | P-NW WATER | COMP. 4 GRABS | SURFACE | A | N | R W |
| 9- | 2 | SEDIMENT | P-NW SEDIMENT | COMP. 4 GRABS | 0-1 FT | A | K | R W |
| *** 10:WATERWORKS NORTH DRAINAGE | | | | | | | | |
| 10- | 1 | WATER | WW-N WATER | COMP. 4 GRABS | SURFACE | A | N | R,S W |
| 10- | 2 | SEDIMENT | WW-N SEDIMENT | COMP. 4 GRABS | 0-1 FT | D | K | R,S W |
| 10- | 2 | SEDIMENT | WW-N SEDIMENT | COMP. 4 GRABS | 0-1 FT | G | K | R,S W |
| *** 11:P AREA SOUTHEAST DRAINAGE | | | | | | | | |
| 11- | 1 | WATER | P-SE WATER | COMP. 4 GRABS | SURFACE | A | N | R W |
| 11- | 2 | SEDIMENT | P-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | A | K | R W |
| 11- | 2 | SEDIMENT | P-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | F | K | R W |
| *** 20:D AREA SOUTH | | | | | | | | |
| 20- | 1 | WATER | D SOUTH | COMP. 4 GRABS | SURFACE | A | N | R X |
| 20- | 2 | SEDIMENT | D SOUTH | COMP. 4 GRABS | 0-1 FT | A | K | R X |
| 20- | 2 | SEDIMENT | D SOUTH | COMP. 4 GRABS | 0-1 FT | F | K | R X |
| *** #3 12:AREA 14 LANDFILL | | | | | | | | |
| 12- | 1 | WATER | DRAINAGE CHANNEL | COMP. 4 GRABS | SURFACE | A | N | P,R W |
| 12- | 2 | SEDIMENT | DRAINAGE CHANNEL | COMP. 4 GRABS | 0-1 FT | A | I,K | P,R W |
| 12- | 2 | SEDIMENT | DRAINAGE CHANNEL | COMP. 4 GRABS | 0-1 FT | G | I,K | P,R W |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))!)
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL SET | ! DEPTH | ! LOCA- TION | ! INTERVAL! & NO. |
|--------|-----------|------------------------------|------------------|----------------|---------------|---------|-----------------|----------------------|
| 12- | 3 | SOIL | BLACK RESIDUE | COMP. 4 GRABS | 0-1 FT | D | I | P,U W |
| *** | | 13:AREA 14 CHANGE HOUSE SITE | | | | | | |
| 13- | 1 | SOIL | TRANSECT 1 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| 13- | 2 | SOIL | TRANSECT 2 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| 13- | 3 | SOIL | TRANSECT 3 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| 13- | 4 | SOIL | TRANSECT 4 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| 13- | 5 | SOIL | TRANSECT 5 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| 13- | 6 | SOIL | TRANSECT 6 | COMP. 10 GRABS | 0-1 FT | A | J | Q Y |
| *** | | 14:AREA 14 SOLVENT STORAGE | | | | | | |
| 14- | 1 | WATER | DITCH NORTH | COMP. 6 GRABS | SURFACE | A | N | Q,R Y |
| 14- | 2 | SEDIMENT | DITCH NORTH | COMP. 6 GRABS | 0-1 FT | A | K | Q,R Y |
| 14- | 3 | WATER | DITCH SOUTH | COMP. 6 GRABS | SURFACE | A | N | Q,R Y |
| 14- | 4 | SEDIMENT | DITCH SOUTH | COMP. 6 GRABS | 0-1 FT | A | K | Q,R Y |
| 14- | 4 | SEDIMENT | DITCH SOUTH | COMP. 6 GRABS | 0-1 FT | F | K | Q,R Y |
| *** | #4 | 15:AREA 7 PLATING POND | | | | | | |
| 15- | 1 | WATER | PLATING POND | COMP. 4 GRABS | SURFACE | A | N | Q Y |
| 15- | 2 | SEDIMENT | PLATING POND | COMP. 4 GRABS | 0-1 FT | A | K | Q Y |
| 15- | 3 | WATER | MONITOR WELL | SINGLE SAMPLE | BAILER | I | - | Q - |
| *** | | 16:AREA 7 INDUSTRIAL SITE | | | | | | |
| 16- | 1 | WATER | DITCH NO.1 | COMP. 2 GRABS | SURFACE | A | N | R,S W |
| 16- | 2 | SEDIMENT | DITCH NO.1 | COMP. 2 GRABS | 0-1 FT | A | K | R,S W |
| 16- | 3 | WATER | DITCH NO.2 | COMP. 2 GRABS | SURFACE | A | N | R W |
| 16- | 4 | SEDIMENT | DITCH NO.2 | COMP. 2 GRABS | 0-1 FT | A | K | R W |
| 16- | 4 | SEDIMENT | DITCH NO.2 | COMP. 2 GRABS | 0-1 FT | F | K | R W |
| 16- | 5 | WATER | DITCH NO.3 | COMP. 2 GRABS | SURFACE | A | N | R W |
| 16- | 6 | SEDIMENT | DITCH NO.3 | COMP. 2 GRABS | 0-1 FT | A | K | R W |
| 16- | 7 | WATER | DITCH NO.4 | COMP. 2 GRABS | SURFACE | A | N | R W |
| 16- | 8 | SEDIMENT | DITCH NO.4 | COMP. 2 GRABS | 0-1 FT | A | K | R W |
| 16- | 9 | SOIL | BLDG 3-4 FRONT | COMP. 12 GRABS | SURFACE | D | I | P Y |
| 16- | 10 | SOIL | BLDG 3-4 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 16- | 10 | SOIL | BLDG 3-4 BACK | COMP. 6 GRABS | 0-1 FT | G | J | Q X |
| 16- | 11 | SOIL | BLDG 3-5 FRONT | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 16- | 12 | SOIL | BLDG 3-5 BACK | COMP. 12 GRABS | SURFACE | A | I | P Y |
| 16- | 13 | SOIL | BLDG 4-4 FRONT | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 16- | 14 | SOIL | BLDG 4-4 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 16- | 15 | SOIL | BLDG 5-2&3 FRONT | COMP. 12 GRABS | SURFACE | D | I | P Y |
| 16- | 15 | SOIL | BLDG 5-2&3 FRONT | COMP. 12 GRABS | SURFACE | F | I | P Y |
| 16- | 16 | SOIL | BLDG 5-2&3 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q X |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))>)!
(See ATTACHMENT S-3)

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCA-TION | INTERVAL & NO. |
|--------|--------|-----------------------------|----------------|---------|----------|-------|-----------|----------------|
| 16- 17 | SOIL | BLDG 6-1 CONTROL | COMP. 6 GRABS | 0-1 FT | A | J | Q | X |
| *** | #5 | 17:JOB CORPS LANDFILL | | | | | | |
| 17- 1 | SOIL | SOIL GRID 1 | COMP. 5 GRABS | 0-1 FT | A | I | P | X |
| 17- 2 | SOIL | SOIL GRID 2 | COMP. 5 GRABS | 0-1 FT | A | I | P | X |
| 17- 2 | SOIL | SOIL GRID 2 | COMP. 5 GRABS | 0-1 FT | G | I | P | X |
| 17- 3 | SOIL | SOIL GRID 3 | COMP. 5 GRABS | 0-1 FT | D | I | P | X |
| 17- 4 | SOIL | SOIL GRID 4 | COMP. 5 GRABS | 0-1 FT | A | I | P | X |
| 17- 5 | SOIL | SOIL GRID 5 | COMP. 5 GRABS | 0-1 FT | A | I | P | X |
| 17- 6 | SOIL | BARE PATCH 1 | COMP. 2 GRABS | 0-1 FT | D | I | P,U | W |
| 17- 6 | SOIL | BARE PATCH 1 | COMP. 2 GRABS | 0-1 FT | G | I | P,U | W |
| 17- 7 | SOIL | BARE PATCH 2 | COMP. 2 GRABS | SURFACE | A | I | P,U | W |
| 17- 8 | WATER | WELL 17-1 | SINGLE SAMPLE | BAILER | I | - | - | - |
| 17- 9 | WATER | WELL 17-2 | SINGLE SAMPLE | BAILER | I | - | - | - |
| 17- 10 | WATER | WELL 17-3 | SINGLE SAMPLE | BAILER | I | - | - | - |
| 17- 11 | WATER | WELL 17-4 | SINGLE SAMPLE | BAILER | I | - | - | - |
| 17- 12 | WATER | POND NO.1 | SINGLE SAMPLE | SURFACE | A | K,N | R | W |
| 17- 13 | WATER | POND NO.2 | SINGLE SAMPLE | SURFACE | A | K,N | R | W |
| *** | #6 | 18:AREA 13 LOADING PLATFORM | | | | | | |
| 18- 1 | SOIL | LOADING DOCK N | COMP. 20 GRABS | 0-1 FT | A | J | Q | Y |
| 18- 2 | SOIL | LOADING DOCK S | COMP. 20 GRABS | 0-1 FT | A | J | Q | Y |
| 18- 3 | SOIL | LOADING DOCK E | COMP. 2 GRABS | 0-1 FT | A | J | Q | W |
| 18- 4 | SOIL | LOADING DOCK W | COMP. 2 GRABS | 0-1 FT | A | I | P,Q | W |
| 18- 4 | SOIL | LOADING DOCK W | COMP. 2 GRABS | 0-1 FT | F | I | P,Q | W |
| *** | | 19:AREA 13 BUNKER 1-3 | | | | | | |
| 19- 1 | SOIL | SOIL GRID NE | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y |
| 19- 2 | SOIL | SOIL GRID SE | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y |
| 19- 3 | SOIL | SOIL GRID NW | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y |
| 19- 3 | SOIL | SOIL GRID NW | COMP. 14 GRABS | 0-1 FT | F | J | Q | Y |
| 19- 4 | SOIL | SOIL GRID FRONT | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y |
| 19- 5 | SOIL | BR. PATCH TRANSECT | COMP. 3 GRABS | 0-1 FT | A | J | Q,U | X |
| *** | | 30:MUNITIONS CONTROL SITE | | | | | | |
| 30- 1 | SOIL | MUNITION CONTROL | SINGLE SAMPLE | SURFACE | D | - | T | W |
| 30- 1 | SOIL | MUNITION CONTROL | SINGLE SAMPLE | SURFACE | G | - | T | W |
| 30- 2 | WATER | MUNITION CONTROL | SINGLE SAMPLE | BAILER | I | - | T | W |
| *** | #7 | 21:SOUTHEAST CORNER FIELD | | | | | | |
| 21- 1 | SOIL | TRANSECT 1 | COMP. 6 GRABS | 0-1 FT | A | J | Q | Y |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))))!
(See ATTACHMENT S-3)

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCA-TION | INTERVAL & NO. |
|------|--------|--------------------------------|------------------|---------------|----------|-------|-----------|----------------|
| 21- | 1 | SOIL | TRANSECT 1 | COMP. 6 GRABS | 0-1 FT | F | J | Q Y |
| 21- | 2 | SOIL | TRANSECT 2 | COMP. 6 GRABS | 0-1 FT | A | J | Q Y |
| 21- | 3 | SOIL | TRANSECT 3 | COMP. 6 GRABS | 0-1 FT | A | J | Q Y |
| 21- | 4 | SOIL | TRANSECT 4 | COMP. 6 GRABS | 0-1 FT | A | J | Q Y |
| *** | #8 | 22:OLD REFUGE SHOP | | | | | | |
| 22- | 1 | WATER | POOL WATER | SINGLE GRAB | SURFACE | A | K,N | P W |
| 22- | 2 | SEDIMENT | STREAM SEDIMENTS | COMP. 2 GRABS | 0-1 FT | A | K | Q,R W |
| 22- | 2 | SEDIMENT | STREAM SEDIMENTS | COMP. 2 GRABS | 0-1 FT | F | K | Q,R W |
| *** | | 24:PEPSI-WEST | | | | | | |
| 24- | 1 | WATER | PEPSI-WEST | COMP. 3 GRABS | SURFACE | A | K,N | R W |
| 24- | 1 | WATER | PEPSI-WEST | COMP. 3 GRABS | SURFACE | F | K,N | R W |
| 24- | 2 | SEDIMENT | PEPSI-WEST | COMP. 3 GRABS | 0-1 FT | A | K | R W |
| 24- | 2 | SEDIMENT | PEPSI-WEST | COMP. 3 GRABS | 0-1 FT | F | K | R W |
| *** | | 25:C.O. CREEK AT MARION LF | | | | | | |
| 25- | 1 | WATER | COC DOWNSTREAM | COMP. 3 GRABS | SURFACE | A | K,N | R W |
| 25- | 2 | SEDIMENT | COC DOWNSTREAM | COMP. 3 GRABS | 0-1 FT | D | K | R W |
| 25- | 3 | SEDIMENT | COC DOWNSTREAM | COMP. 3 GRABS | 0-1 FT | G | K | R W |
| 25- | 3 | WATER | COC UPSTREAM | COMP. 3 GRABS | SURFACE | A | - | T W |
| 25- | 4 | SEDIMENT | COC UPSTREAM | COMP. 3 GRABS | 0-1 FT | A | - | T W |
| 25- | 5 | WATER | LF POND | COMP. 3 GRABS | SURFACE | A | K,N | R W |
| 25- | 6 | SEDIMENT | LF POND | COMP. 3 GRABS | 0-1 FT | A | K | R W |
| *** | | 26:C.O. CREEK BELOW MARION STP | | | | | | |
| 26- | 1 | WATER | COC AT S. CARBON | COMP. 3 GRABS | SURFACE | A | K,N | R W |
| 26- | 2 | SEDIMENT | COC AT S. CARBON | COMP. 3 GRABS | 0-1 FT | A | K | R W |
| 26- | 3 | SEDIMENT | COC AT S. CARBON | COMP. 3 GRABS | 0-1 FT | G | K | R W |
| 26- | 3 | WATER | COC AT COURT ST. | COMP. 3 GRABS | SURFACE | A | K,N | R W |
| 26- | 4 | SEDIMENT | COC AT COURT ST. | COMP. 3 GRABS | 0-1 FT | A | K | R W |
| *** | | 27:C.O. CREEK BELOW 157 DREDGE | | | | | | |
| 27- | 1 | WATER | COC AT CHAMMNESS | COMP. 3 GRABS | SURFACE | A | K,N | R,S W |
| 27- | 2 | SEDIMENT | COC AT CHAMMNESS | COMP. 3 GRABS | 0-1 FT | D | K | R,S W |
| *** | #9 | 28:WATER TOWER LANDFILL | | | | | | |
| 28- | 1 | SOIL | MAIN GULLY | COMP. 8 GRABS | 0-1 FT | D | K | R,S X |
| 28- | 2 | SOIL | TRANS. GULLY | COMP. 6 GRABS | 0-1 FT | A | I,K | P,R X |
| 28- | 2 | SOIL | TRANS. GULLY | COMP. 6 GRABS | 0-1 FT | G | I,K | P,R X |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))))!
(See ATTACHMENT S-3)

| ! I.D. ! | MATRIX! | NAME | ! TYPE ! | DEPTH | ! ANAL ! SET | DEPTH ! | LOCA- TION | INTERVAL! & NO. |
|----------|---------|--------------------------|--------------------|----------------|-----------------|---------|---------------|--------------------|
| 28- | 3 | SOIL | SOIL GRID 1 | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 28- | 4 | SOIL | SOIL GRID 2 | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 28- | 5 | SOIL | SOIL GRID 3 | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 28- | 6 | SOIL | SOIL GRID 4 | COMP. 6 GRABS | 0-1 FT | A | J | Q X |
| 28- | 7 | WATER | WELL 28-1 | SINGLE GRAB | BAILER | I | - | V W |
| 28- | 8 | WATER | WELL 28-2 | SINGLE GRAB | BAILER | I | - | V W |
| 28- | 9 | SOIL | SOUTH END OF DITCH | GRAB | 0-1 FT | A | I,K | P,R W |
| 28- | 10 | SOIL | NORTH END OF DITCH | GRAB | 0-1 FT | A | I,K | P,R W |
| 28- | 11 | SOIL | NORTH OF 28-4 | GRAB | 0-1 FT | A | I | P W |
| 28- | 12 | SOIL | NORTHWEST OF 28-3 | GRAB | 0-1 FT | A | I | P W |
| 28- | 13 | SOIL | N. FIELD-OLD 28-9 | GRAB | 0-1 FT | A | I | P W |
| 28- | 14 | SOIL | GULLY | GRAB | 0-1 FT | A | I,K | P,R W |
| *** | #10 | 29:FIRE STATION LANDFILL | | | | | | |
| 29- | 1 | SOIL | EAST FACE 1 | COMP. 12 GRABS | 0&1 FT | A | I | P X |
| 29- | 2 | SOIL | EAST FACE 2 | COMP. 12 GRABS | 0&1 FT | A | I | P X |
| 29- | 2 | SOIL | EAST FACE 2 | COMP. 12 GRABS | 0&1 FT | G | I | P X |
| 29- | 3 | SOIL | EAST FACE 3 | COMP. 12 GRABS | 0&1 FT | D | I | P X |
| 29- | 4 | SOIL | EAST FACE 4 | COMP. 12 GRABS | 0&1 FT | A | I | P X |
| 29- | 5 | SOIL | NORTH FACE 1 | COMP. 12 GRABS | 0&1 FT | A | I | P X |
| 29- | 6 | SOIL | NORTH FACE 2 | COMP. 12 GRABS | 0&1 FT | D | I | P X |
| 29- | 7 | SOIL | NORTH FACE 3 | COMP. 12 GRABS | 0&1 FT | A | I | P X |
| 29- | 8 | WATER | WELL 29-1 | SINGLE GRAB | BAILER | I | - | T W |
| 29- | 9 | WATER | WELL 29-2 | SINGLE GRAB | BAILER | I | - | V W |
| 29- | 10 | WATER | WELL 29-3 | SINGLE GRAB | BAILER | I | - | V W |
| 29- | 11 | WATER | WELL 29-4 | SINGLE GRAB | BAILER | I | - | V W |
| *** | #11 | 32:AREA 9 LANDFILL | | | | | | |
| 32- | 1 | SOIL | SOIL GRID 1 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P Z |
| 32- | 2 | SOIL | SOIL GRID 1-0 | TOP CORE COMP. | 0-6 INCH | C | I | P Z |
| 32- | 3 | SOIL | SOIL GRID 1-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P Z |
| 32- | 4 | SOIL | SOIL GRID 1-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P Z |
| 32- | 5 | SOIL | SOIL GRID 2 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P Z |
| 32- | 6 | SOIL | SOIL GRID 2-0 | TOP CORE COMP. | 0-6 INCH | C | I | P Z |
| 32- | 7 | SOIL | SOIL GRID 2-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P Z |
| 32- | 8 | SOIL | SOIL GRID 2-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P Z |
| 32- | 9 | SOIL | SOIL GRID 3 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P Z |
| 32- | 10 | SOIL | SOIL GRID 3-0 | TOP CORE COMP. | 0-6 INCH | C | I | P Z |
| 32- | 11 | SOIL | SOIL GRID 3-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P Z |
| 32- | 12 | SOIL | SOIL GRID 3-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P Z |
| 32- | 13 | SOIL | SOIL GRID 4 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P Z |
| 32- | 14 | SOIL | SOIL GRID 4-0 | TOP CORE COMP. | 0-6 INCH | C | I | P Z |
| 32- | 15 | SOIL | SOIL GRID 4-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P Z |
| 32- | 16 | SOIL | SOIL GRID 4-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P Z |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))>)!
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL SET | ! DEPTH | ! LOCA- TION | ! INTERVAL! & NO. |
|--------|-----------|------------------|-----------------|----------|---------------|---------|-----------------|----------------------|
| 32- 17 | SOIL | SOIL GRID 5 | COMP.#1'DEPTHS | 0-12 FT | H | L,M | P | Z |
| 32- 18 | SOIL | SOIL GRID 5-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z |
| 32- 19 | SOIL | SOIL GRID 5-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z |
| 32- 20 | SOIL | SOIL GRID 5-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z |
| 32- 21 | SOIL | SOIL GRID 6 | COMP.#1'DEPTHS | 0-12 FT | H | L,M | P | Z |
| 32- 22 | SOIL | SOIL GRID 6-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z |
| 32- 23 | SOIL | SOIL GRID 6-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z |
| 32- 24 | SOIL | SOIL GRID 6-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z |
| 32- 25 | SOIL | SOIL GRID 7 | COMP.#1'DEPTHS | 0-12 FT | H | L,M | P | Z |
| 32- 26 | SOIL | SOIL GRID 7-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z |
| 32- 27 | SOIL | SOIL GRID 7-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z |
| 32- 28 | SOIL | SOIL GRID 7-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z |
| 32- 29 | SOIL | SOIL GRID 8 | COMP.#1'DEPTHS | 0-12 FT | H | L,M | P | Z |
| 32- 30 | SOIL | SOIL GRID 8-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z |
| 32- 31 | SOIL | SOIL GRID 8-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z |
| 32- 32 | SOIL | SOIL GRID 8-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z |
| 32- 33 | SOIL | SOIL GRID 9 | COMP.#1'DEPTHS | 0-12 FT | H | L,M | P | Z |
| 32- 34 | SOIL | SOIL GRID 9-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z |
| 32- 35 | SOIL | SOIL GRID 9-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z |
| 32- 36 | SOIL | SOIL GRID 9-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z |
| 32- 37 | SOIL | NORTH TRANSECT 1 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 38 | SOIL | NORTH TRANSECT 1 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 39 | SOIL | EAST TRANSECT 1 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 40 | SOIL | EAST TRANSECT 2 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 41 | SOIL | SOUTH TRANSECT 1 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 42 | SOIL | SOUTH TRANSECT 2 | COMP.#3' INTRVL | SURFACE | B | K | R or T | Y |
| 32- 43 | SEDIMENT | INT. CREEK 1-0 | GRAB | SURFACE | A | J,K | Q,R | Z |
| 32- 44 | SEDIMENT | INT. CREEK 1-1 | GRAB | 3 FEET | A | J,K,L,M | Q,R | Z |
| 32- 45 | SEDIMENT | INT. CREEK 1-2 | GRAB | 6 FEET | A | J,K,L,M | Q,R | Z |
| 32- 46 | SEDIMENT | INT. CREEK 2-0 | GRAB | SURFACE | A | J,K | Q,R | Z |
| 32- 47 | SEDIMENT | INT. CREEK 2-1 | GRAB | 3 FEET | A | J,K,L,M | Q,R | Z |
| 32- 48 | SEDIMENT | INT. CREEK 2-2 | GRAB | 6 FEET | A | J,K,L,M | Q,R | Z |
| 32- 49 | SEDIMENT | INT. CREEK 3-0 | GRAB | SURFACE | A | J,K | Q,R | Z |
| 32- 50 | SEDIMENT | INT. CREEK 3-1 | GRAB | 3 FEET | A | J,K,L,M | Q,R | Z |
| 32- 51 | SEDIMENT | INT. CREEK 3-2 | GRAB | 6 FEET | A | J,K,L,M | Q,R | Z |
| 32- 52 | SEDIMENT | INT. CREEK 4-0 | GRAB | SURFACE | A | J,K | Q,R | Z |
| 32- 53 | SEDIMENT | INT. CREEK 4-1 | GRAB | 3 FEET | A | J,K,L,M | Q,R | Z |
| 32- 54 | SEDIMENT | INT. CREEK 4-2 | GRAB | 6 FEET | A | J,K,L,M | Q,R | Z |
| 32- 55 | SEDIMENT | INT. CREEK 5-0 | GRAB | SURFACE | A | J,K | Q,R | Z |
| 32- 56 | SEDIMENT | INT. CREEK 5-1 | GRAB | 3 FEET | A | J,K,L,M | Q,R | Z |
| 32- 57 | SEDIMENT | INT. CREEK 5-2 | GRAB | 6 FEET | A | J,K,L,M | Q,R | Z |
| 32- 58 | SEDIMENT | INT. CREEK 6-0 | GRAB | SURFACE | D | J,K | Q,R | Z |
| 32- 59 | SEDIMENT | INT. CREEK 6-1 | GRAB | 3 FEET | D | J,K,L,M | Q,R | Z |
| 32- 60 | SEDIMENT | INT. CREEK 6-2 | GRAB | 6 FEET | D | J,K,L,M | Q,R | Z |
| 32- 61 | WATER | WELL 1 | SINGLE SAMPLE | BAILER | I | - | T | W |
| 32- 62 | WATER | WELL 2 | SINGLE SAMPLE | BAILER | I | - | V | W |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))))!
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL SET | ! DEPTH | ! LOCA- TION | ! INTERVAL! & NO. |
|--------------------------------|-----------|-----------------|---------------|----------|---------------|---------|-----------------|----------------------|
| 32- 63 | WATER | WELL 3 | SINGLE SAMPLE | BAILER | I | - | V | W |
| 32- 64 | SOIL | YELLOW SPOT | SINGLE SAMPLE | SURFACE | A | I | P | W |
| 32- 65 | SOIL | BEFORE CLEANING | SINGLE SAMPLE | SURFACE | B | K | T | W |
| 32- 66 | SOIL | AFTER CLEANING | SINGLE SAMPLE | SURFACE | B | K | T | W |
| *** 33:AREA 9 BUILDING COMPLEX | | | | | | | | |
| 33- 1 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 2 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 3 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 4 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 5 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 6 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 7 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 8 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 9 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-10 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-11 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-12 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-13 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-14 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-15 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-16 | SOIL LOC. | 6 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-17 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-18 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-19 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-20 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-21 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-22 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-23 | SOIL LOC. | 9 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-24 | SOIL LOC. | 10 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-25 | SOIL LOC. | 11 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-26 | SOIL LOC. | 12 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-27 | SOIL LOC. | 13 - I-1- 25 | CORE SURFACE | 0-1 FOOT | D | J | Q1 | Z |
| 33-28 | SOIL LOC. | 14 - I-1- 23 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33-29 | SOIL LOC. | 15 - I-1- 23 | CORE SURFACE | 0-6 INCH | B | J | Q1 | Z |
| 33-30 | SOIL LOC. | 16 - I-1- 64 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33-31 | SOIL LOC. | 17 - I-1- 64 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-32 | SOIL LOC. | 18 - I-1- 22 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33-33 | SOIL LOC. | 19 - I-1- 21 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33-34 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-35 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-36 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-37 | SOIL LOC. | 21 - I-1- 21 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-38 | SOIL LOC. | 22 - I-1- 21 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-39 | SOIL LOC. | 23 - STAGING | DITCH | 0-1 FOOT | B | K | Q1 | Z |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

((((RATIONALE FACTORS))))
(See ATTACHMENT S-3)

| ! I.D. ! | MATRIX! | NAME | ! TYPE ! | DEPTH | ! ANAL ! SET | DEPTH ! | LOCA- ! TION | INTERVAL! & NO. |
|----------|-----------|--------------|---------------|----------|-----------------|---------|-----------------|--------------------|
| 33- 40 | SOIL LOC. | 24 - STAGING | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33- 41 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 42 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 43 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 44 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 45 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 46 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 47 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 48 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 49 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 50 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 51 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 52 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 53 | SOIL LOC. | 29 - I-1- 24 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33- 54 | SOIL LOC. | 30 - I-1- 24 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33- 55 | SOIL LOC. | 31 - I-1- 24 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33- 56 | SOIL LOC. | 32 - I-1- 24 | DITCH | 0-1 FOOT | B | K | Q1 | Z |
| 33- 57 | SOIL LOC. | 33 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 58 | SOIL LOC. | 34 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 59 | SOIL LOC. | 35 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 60 | SOIL LOC. | 36 - I-1- 20 | CORE SURFACE | 0-1 FOOT | D | J | Q1 | Z |
| 33- 61 | SOIL LOC. | 37 - I-1- 19 | CORE SURFACE | 0-6 INCH | B | J | Q1 | Z |
| 33- 62 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 63 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 64 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 65 | SOIL LOC. | 39 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 66 | SOIL LOC. | 40 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 67 | SOIL LOC. | 41 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 68 | SOIL LOC. | 41 - I-1- 2 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 69 | SOIL LOC. | 41 - I-1- 2 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 70 | SOIL LOC. | 42 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 71 | SOIL LOC. | 43 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 72 | SOIL LOC. | 44 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 73 | SOIL LOC. | 44 - I-1- 2 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 74 | SOIL LOC. | 44 - I-1- 2 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 75 | SOIL LOC. | 45 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 76 | SOIL LOC. | 56 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 77 | SOIL LOC. | 56 - I-1- 2 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 78 | SOIL LOC. | 56 - I-1- 2 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 79 | SOIL LOC. | 57 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 80 | SOIL LOC. | 58 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 81 | SOIL LOC. | 46 - I-1- 5 | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 82 | SOIL LOC. | 46 - I-1- 5 | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 83 | SOIL LOC. | 46 - I-1- 5 | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 84 | SOIL LOC. | 47 - I-1- 5 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 85 | SOIL LOC. | 48 - I-1- 5 | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))!)
(See ATTACHMENT S-3)

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL SET | ! DEPTH | ! LOCA- TION | ! INTERVAL! & NO. |
|--------|-----------|-----------|------------------|----------|------------|---------|--------------|-------------------|
| 33- 86 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 87 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 88 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 89 | SOIL LOC. | 50 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 90 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 91 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 92 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 93 | SOIL LOC. | 52 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 94 | SOIL LOC. | 53 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 95 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33- 96 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33- 97 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33- 98 | SOIL LOC. | 55 - I-1- | 35 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33- 99 | SOIL LOC. | 59 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-100 | SOIL LOC. | 60 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-101 | SOIL LOC. | 61 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-102 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-103 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-104 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-105 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-106 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-107 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-108 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-109 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-110 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-111 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-112 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-113 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-114 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-115 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-116 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-117 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-118 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-119 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-120 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-121 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-122 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-123 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-124 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-125 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-126 | SOIL LOC. | 70 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-127 | SOIL LOC. | 71 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-128 | SOIL LOC. | 72 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-129 | SOIL LOC. | 73 - I-1- | 3 CORE SURFACE | 0-1 FOOT | D | J | Q1 | Z |
| 33-130 | SOIL LOC. | 74 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-131 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))!)
(See ATTACHMENT S-3)

| ! I.D. ! | MATRIX! | NAME | ! TYPE ! | DEPTH | ! ANAL ! | DEPTH ! | LOCA- ! | INTERVAL! |
|----------|-----------|--------------|-----------------|----------|----------|---------|---------|-----------|
| | | | | | SET | | TION | & NO. |
| 33-132 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-133 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-134 | SOIL LOC. | 76 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-135 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-136 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-137 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-138 | SOIL LOC. | 78 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-139 | SOIL LOC. | 79 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-140 | SOIL LOC. | 80 - I-1- | 9 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-141 | SOIL LOC. | 80 - I-1- | 9 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-142 | SOIL LOC. | 80 - I-1- | 9 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-143 | SOIL LOC. | 81 - I-1- | 9 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-144 | SOIL LOC. | 82 - I-1- | 9 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-145 | SOIL LOC. | 83 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-146 | SOIL LOC. | 83 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-147 | SOIL LOC. | 83 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-148 | SOIL LOC. | 84 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-149 | SOIL LOC. | 84 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-150 | SOIL LOC. | 84 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-151 | SOIL LOC. | 85 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-152 | SOIL LOC. | 85 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-153 | SOIL LOC. | 85 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-154 | SOIL LOC. | 86 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-155 | SOIL LOC. | 86 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-156 | SOIL LOC. | 86 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-157 | SOIL LOC. | 87 - I-1-23C | CORE VERTICAL | 0-1 FOOT | D | J | Q1 | Z |
| 33-158 | SOIL LOC. | 87 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-159 | SOIL LOC. | 87 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-160 | SOIL LOC. | 88 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-161 | SOIL LOC. | 88 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-162 | SOIL LOC. | 88 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-163 | SOIL LOC. | 89 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-164 | SOIL LOC. | 89 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-165 | SOIL LOC. | 89 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-166 | SOIL LOC. | 90 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-167 | SOIL LOC. | 90 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-168 | SOIL LOC. | 90 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-169 | SOIL LOC. | 91 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-170 | SOIL LOC. | 91 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-171 | SOIL LOC. | 91 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-172 | SOIL LOC. | 92 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-173 | SOIL LOC. | 92 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-174 | SOIL LOC. | 92 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-175 | SOIL LOC. | 93 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-176 | SOIL LOC. | 93 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-177 | SOIL LOC. | 93 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))>)!
(See ATTACHMENT S-3)

| ! I.D. ! | MATRIX! | NAME | ! TYPE ! | DEPTH | ! ANAL ! SET | DEPTH ! | LOCA- TION | !INTERVAL! & NO. |
|----------|----------------------|---------------|---------------|----------|-----------------|---------|---------------|---------------------|
| 33-178 | SOIL LOC. | 94 - I-1-23C | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-179 | SOIL LOC. | 95 - I-1-23C | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z |
| 33-180 | SOIL LOC. | 96 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z |
| 33-181 | SOIL LOC. | 96 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z |
| 33-182 | SOIL LOC. | 96 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z |
| 33-183 | SOIL LOC. | 97 - I-1- 9 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-184 | SOIL LOC. | 98 - I-1- 15 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-185 | SOIL LOC. | 99 - I-1- 1 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-186 | SOIL LOC. | 100 - I-1- 29 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-187 | SOIL LOC. | 101 - I-1- 8 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-188 | SOIL LOC. | 102 - I-1- 8 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X |
| 33-189 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-190 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-191 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-192 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-193 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-194 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-195 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-196 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-197 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-198 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-199 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-200 | SOIL - SPARE NUMBERS | | | | B | | | |
| 33-201 | SOIL - SPARE NUMBERS | | | | B | | | |

*** 35:AREA 9 EAST WATERWAY

| | | | | | | | | |
|-------|----------|----------|---------------|--------|---|---|---|---|
| 35- 1 | SEDIMENT | WATERWAY | COMP. 5 GRABS | 0-1 FT | A | I | P | Y |
| 35- 1 | SEDIMENT | WATERWAY | COMP. 5 GRABS | 0-1 FT | F | I | P | Y |

*** #12 34:CRAB ORCHARD LAKE

| | | | | | | | | |
|--------|-------|--------------------|----------------|-------------|---|---|---|---|
| 34- 1 | WATER | REFUGE INTAKE | GRAB | NA | E | - | T | W |
| 34- 2 | WATER | MARION INTAKE | GRAB | NA | E | - | T | W |
| 34- 3 | WATER | MARION RES.-INTAKE | GRAB | NA | E | - | T | W |
| 34- 4 | WATER | REFUGE TREATED H2O | GRAB | NA | E | - | T | W |
| 34- 5 | WATER | MARION TREATED H2O | GRAB | NA | E | - | T | W |
| 34- 6 | WATER | LAKE 1 B | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 7 | WATER | LAKE 2 C | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 8 | WATER | LAKE 3 G | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 9 | WATER | LAKE 4 H | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 10 | WATER | LAKE 5 A | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 11 | WATER | LAKE 6 D | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 12 | WATER | LAKE 7 E | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 13 | WATER | LAKE 8 F | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 14 | WATER | LAKE 9 I | COMP. 3 DEPTHS | SURF-0.8 FT | I | O | S | W |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS))))!
(See ATTACHMENT S-3)

| ! I.D. ! | MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL ! SET | ! DEPTH ! TION | ! LOCA- ! & NO. | ! INTERVAL! |
|----------|----------|----------------|-----------------|-------------|-----------------|-------------------|--------------------|-------------|
| 34- 15 | WATER | LAKE 10J | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W |
| 34- 16 | SEDIMENT | LAKE 1 B | GRAB | DREDGE | H | K | S | W |
| 34- 17 | SEDIMENT | LAKE 2 C | GRAB | DREDGE | H | K | S | W |
| 34- 18 | SEDIMENT | LAKE 3 G | GRAB | DREDGE | I | K | S | W |
| 34- 19 | SEDIMENT | LAKE 4 H | GRAB | DREDGE | I | K | S | W |
| 34- 20 | SEDIMENT | LAKE 5 A | GRAB | DREDGE | I | K | S | W |
| 34- 21 | SEDIMENT | LAKE 6 D | GRAB | DREDGE | I | K | S | W |
| 34- 22 | SEDIMENT | LAKE 7 E | GRAB | DREDGE | I | K | S | W |
| 34- 23 | SEDIMENT | LAKE 8 F | GRAB | DREDGE | I | K | S | W |
| 34- 24 | SEDIMENT | LAKE 9 I | GRAB | DREDGE | I | K | S | W |
| 34- 25 | SEDIMENT | LAKE 10J | GRAB | DREDGE | I | | | |
| 34- 26 | FISH | LAKE SITE 1 B | COMP. 5 CARP | NA | I | | | |
| 34- 27 | FISH | LAKE SITE 1 B | COMP. 5 BASS | NA | I | | | |
| 34- 28 | FISH | LAKE SITE 1 B | COMP. 5 BASS | NA | I | | | |
| 34- 48 | FISH | LAKE SITE 1 B | COMP.5 BULLHEAD | NA | I | | | |
| 34- 49 | FISH | LAKE SITE 1 B | COMP.5 BULLHEAD | NA | I | | | |
| 34- 50 | FISH | LAKE SITE 1 B | COMP.2 CATFISH | NA | I | | | |
| 34- 29 | FISH | LAKE SITE 2 C | COMP. 5 CARP | NA | H | | | |
| 34- 30 | FISH | LAKE SITE 2 C | COMP. 5 CARP | NA | I | | | |
| 34- 31 | FISH | LAKE SITE 2 C | COMP. 5 BASS | NA | H | | | |
| 34- 31 | FISH | LAKE SITE 2 C | COMP.5 BULLHEAD | NA | I | | | |
| 34- 32 | FISH | LAKE SITE 2 C | COMP.5 BULLHEAD | NA | I | | | |
| 34- 32 | FISH | LAKE SITE 2 C | COMP.5 CATFISH | NA | I | | | |
| 34- 32 | FISH | LAKE SITE 3 G | COMP. 5 CARP | NA | I | | | |
| 34- 33 | FISH | LAKE SITE 3 G | COMP. 5 CARP | NA | I | | | |
| 34- 34 | FISH | LAKE SITE 3 G | COMP. 5 BASS | NA | I | | | |
| 34- 34 | FISH | LAKE SITE 3 G | COMP.5 BULLHEAD | NA | I | | | |
| 34- 35 | FISH | LAKE SITE 3 G | COMP.5 BULLHEAD | NA | I | | | |
| 34- 35 | FISH | LAKE SITE 4 H | COMP. 5 CARP | NA | I | | | |
| 34- 36 | FISH | LAKE SITE 4 H | COMP. 5 BASS | NA | I | | | |
| 34- 37 | FISH | LAKE SITE 4 H | COMP. 5 BASS | NA | I | | | |
| 34- 39 | FISH | LAKE SITE 4 H | COMP.5 BULLHEAD | NA | I | | | |
| 34- 40 | FISH | LAKE SITE 4 H | COMP.5 BULLHEAD | NA | I | | | |
| 34- 41 | FISH | LAKE SITE 4 H | COMP.4 CATFISH | NA | I | | | |
| 34- 38 | FISH | LAKE CONTROL J | COMP. 5 CARP | NA | I | | | |
| 34- 39 | FISH | LAKE CONTROL J | COMP. 5 CARP | NA | I | | | |
| 34- 40 | FISH | LAKE CONTROL J | COMP. 3 BASS | NA | I | | | |
| 34- 41 | FISH | LAKE CONTROL J | COMP. 5 BASS | NA | I | | | |
| 34- 56 | FISH | LAKE CONTROL J | COMP.5 BULLHEAD | NA | I | | | |
| 34- 57 | FISH | LAKE CONTROL J | COMP.5 BULLHEAD | NA | I | | | |
| 34- 58 | FISH | LAKE CONTROL J | COMP.3 CATFISH | NA | I | | | |
| 34- 42 | TURTLES | LAKE SITE 1 B | COMP. OF 2 | BOTTOM | I | | | |
| 34- 43 | TURTLES | LAKE SITE 2 C | COMP. OF 2 | BOTTOM | I | | | |
| 34- 44 | TURTLES | LAKE SITE 3 G | COMP. OF 2 | BOTTOM | I | | | |
| 34- 45 | CRAYFISH | LAKE SITE 1 B | COMP.OF 300gms | SURFACE | I | | | |
| 34- 46 | CRAYFISH | LAKE SITE 2 C | COMP.OF 300gms | SURFACE | I | | | |

ATTACHMENT S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

!(((RATIONALE FACTORS)))!
(See ATTACHMENT S-3)

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCA- TION | INTERVAL & NO. |
|--------|----------|------------------------|----------------|---------|-------------|-------|---------------|-------------------|
| 34- 47 | CRAYFISH | LAKE SITE 3 6 | COMP.OF 300gms | SURFACE | I | | | |
| *** | #13 | 31:REFUGE CONTROL SITE | | | | | | |
| 31- 1 | SOIL | REFUGE CONTROL | SINGLE SAMPLE | SURFACE | D | -- | T | W |
| 31- 1 | SOIL | REFUGE CONTROL | SINGLE SAMPLE | SURFACE | G | -- | T | W |
| 31- 2 | WATER | REFUGE CONTROL | SINGLE SAMPLE | BAILER | I | -- | T | W |
| END | | | | | | | | |

ATTACHMENTS S-3 AND S-4
SAMPLING AND ANALYSIS RATIONALE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
SANGAMO-WESTON, INC.

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

NOVEMBER, 1985

ATTACH S-3

REMEDIAL INVESTIGATION/FEASIBILITY STUDY CRAB ORCHARD NATIONAL WILDLIFE REFUGE

SPECIFIC RATIONALE FACTORS FOR SELECTING SAMPLES AND ANALYSES FOR PHASE I

KEY TO RATIONALE FACTORS CITED IN ATTACHMENT S-4

ANALYSIS SETS

- A. Analysis Set A (organics screening, metals, cyanide, indicators, explosives, nitrogen and phosphorus) is specified for all sites where few or no previous analytical tests have been conducted. This sequence of analyses was chosen to enable problem identification associated with the range of industries which have operated on the Refuge. The results of organics screening are used to determine sampling locations for resampling and analysis by full CLP protocol (Analysis Set F).
- B. Analysis Set B consists only of PCB analysis. This set is specified only for samples within the Area 9 Building Complex (Site 33) and portions of the Area 9 Landfill (Site 32) where the spatial distribution and limits of PCB contamination are to be determined.
- C. Analysis Set C consists of PCBs, PCDF/PCDD screening, indicators, nitrogen and cation exchange capacity. Set C analyses are specified only for intermediate core sections (top, middle and bottom) within the Area 9 Landfill.

Note: PCDF/PCDD screening in set C has been changed to the full CLP protocol analysis (addition of Set H) during the initial sampling effort. This change was necessary to avoid a second round drilling effort in Phase I (d). This represents a change to the original Work Plan.

- D. Analysis Set D is the same as Analysis Set A, except that PCDF/PCDD screening is also included. One sample (and sometimes 2 or 3) was selected from each site which was anticipated to contain PCBs or organics for PCDF/PCDD screening.
- E. Analysis Set E consists of the Primary and Secondary Drinking Water Standards. These are conducted only on the Phase I water supply samples (Samples 34-1 through 34-5). Phase II Crab Orchard Lake water column samples (Samples 34-6 through 34-15) are to be analyzed for a wider range of parameters which will be selected after evaluation of results from the Phase I sampling effort. However, at least one water column sample will be analyzed for the full Set G suite of parameters, as requested by U.S. EPA. This represents a change to the original Work Plan.

- F. Analysis Set F is conducted on a second round (Phase I (d)) re-sampling for selected locations which were previously analyzed for the Set A suite of analyses. It consists of a second round of organic analyses by full CLP protocol. The rationale for selection of Set F samples is to choose those samples on a given site which show the highest concentrations of organics (by FID screening, PCB, TOC, TOX, or organic nitrogen). The Set F organic CLP analyses will then establish those parameters to be emphasized during the Phase II investigation of extent of contamination.
- G. Analysis Set G is conducted on a second round (Phase I (d)) re-sampling for selected locations which were previously analyzed for the Set A or D suites of analyses by full CLP protocol in addition to PCDF/PCDD analyses by full CLP protocol. The rationale for selection of Set G samples is similar to that for Set F, except that Set G is specified on those sites where PCBs (and hence PCDF/PCDD) are anticipated to be a potential problem.

NOTE: The original Work Plan specified that Priority Pollutant metals analyses by AA Spectroscopy would be conducted for Set F and G samples in addition to the ICP screening for the corresponding Set A and D samples. However, the analytical sensitivity of the ICP analyses has been adequate. Therefore, the AA Spectroscopy metals have been dropped from the Set F and G suites. This represents a change to the original Work Plan.

- H. Analysis Set H was previously full CLP protocol PCDF/PCDD analysis subsequent to screening via Analysis Set C at the Area 9 Landfill. Set H was incorporated into the Set C analyses to avoid second-round drilling at Area 9 (see note following C above). Set H has been redefined to consist of organic analyses by full CLP protocol in addition to PCDF/PCDD analyses by full CLP protocol and other soil characteristics as in Set D. Set H samples are not preceded by a set of screening samples.
- I. Analysis Set I will be conducted on those samples scheduled to be collected during the Phase II sampling effort. Samples for Set I (See Attachment S-4) include groundwater monitoring wells, and Crab Orchard Lake water, sediment and fish. The Set I suite of parameters will depend on the analytical results obtained from Phases Ia, Ib, Ic and Id.

SAMPLING DEPTHS

- I. Visual observations indicate the presence of potential contaminants (sludges, debris, etc.) at or near the surface.
- J. Historic information indicated that contaminants may have been disposed or spilled in the general geographic area, but visual observations do not provide guidance to location.
- K. Dispersed contaminants from the potential source area are likely to have accumulated at or near the surface of stream bottoms or

drainage swales as a result of sedimentation at points of low flow velocity.

- L. Sampling depths greater than 1 ft were specified because historic information indicated the possibility that source materials may have been buried and covered with soil.
- M. Sampling depths greater than 1 ft were specified to determine if vertical dispersion of near-surface contaminants has occurred.
- N. An upper surface water sample is expected to be representative of the water column as a whole, since stratification is not expected to be significant.
- O. Water column samples are specified for a number of intervals of depth to determine if contaminants are stratified at different concentrations.

SAMPLING LOCATIONS

- P. Visual observations indicate the presence of potential contaminants (sludges, debris, etc.) at or near the surface in the location specified for sampling.
- Q. Historic information indicated that contaminants were disposed or spilled in the general geographic area, but visual observations do not provide guidance to location. Therefore, lateral composites were prepared to screen a questionable area. If elevated concentrations of contaminants are found within a compositing area then additional Phase II sampling and analyses may be required to define the lateral and vertical distribution of the contaminated area.
- Q1. Previous sampling and analytical data are available covering this general area. (See Figure 2 of Status Report dated September 11, 1985 for illustrated data for the Area 9 Building Complex, Site 33. Proposed Phase I sampling locations are shown on Figure 1 of that document). The sampling sites were located to permit the evaluation of spatial distributions within previously composited areas. In addition, the sampling locations attempt to define the limits of contaminated areas by the sampling of spots expected to be clean (e.g., outside of ditches and deeper soils underneath contaminated zones).
- R. Dispersed contaminants from a potential source area are likely to have accumulated within streams or drainage swales downgradient or adjacent to the source.
- S. Surface topography indicates that the specified sampling location is downgradient from a number of potential source areas. A broader range of contaminants may be present at this location representing the area as a whole. However, because of differing mobilities associated with different contaminants, this downgradient sample may not be representative of the distribution of materials in the

upgradient sources. In addition, because of dispersion, a down-gradient sample is likely to be less concentrated than the source from which it came.

- T. The specified sampling location is believed to be located upgradient of the suspected source area or outside of the dispersion pattern from the suspected source.
- U. The specified sampling location is within or near an area of stressed or unusual vegetation pattern.
- V. Ground water monitoring well is located downgradient from a suspected source area.

SAMPLING INTERVAL AND NUMBER OF SAMPLES

- W. The suspect area is small in size (1 to 10 sq ft) and well defined, either because of physical appearance or to evaluate a single-point area. Closely-spaced (2 to 5 ft) lateral composites of from 1 to 4 samples are specified to characterize the single-point area.
- X. The suspect area is large in size (greater than 100 sq ft or longer than 100 ft). Generally, in the larger compositing areas, there are few features to suggest whether or not a problem exists, other than a historic report of past activities in the general area. Samples are spaced from 20 to 50 ft apart and composited. It was generally attempted to limit the number of samples in the composite within the range of 6 to 10, since sensitivity to detecting a hot spot is reduced as the number of samples in the composite increases.
- Z. The sampling interval for vertical samples is self-explanatory on Table S-2. The objective for obtaining depth samples is to determine the vertical distribution of buried materials or to evaluate the limits of vertical migration from a near-surface source material.

WORK PLAN SUPPLEMENT
ATTACHMENT S-5
SITE OPERATIONS PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
SANGAMO-WESTON, INC.

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

DECEMBER, 1985

SITE OPERATIONS PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

A. PERSONNEL REQUIREMENTS

Site operations will involve personnel from O'Brien & Gere Engineers, U.S. Fish & Wildlife Service and U.S. EPA. Specific sampling team members are listed below:

- Cornelius B. Murphy, Jr., PhD (Project Officer)
- Steven R. Garver, P.E. (Project Manager)
- Dharmarajan R. Iyer, PhD (Primary Field Chief)
- Michael P. Quirk (Quality Control Officer)
- Swiatoslaw W. Kaczmar, PhD (Safety Officer)
- Robert Foresti (Field Hydrogeologist)
- John Jurgeil (Sampler)
- Maria Schwalbe (Sampler)
- Richard A. Ruelle (U.S. FWS Project Manager)
- Rodney Gawber (U.S. EPA On-scene Coordinator)

Personnel usage associated with specific phases of sampling is discussed in the Sections below.

B. SAMPLING SCHEDULES AND ASSUMPTIONS

Sampling Schedule Rationale

As explained on pages 7 through 13 of the June 1985 Work Plan, the field sampling program has been separated into two major phases. The purpose of Phase I is to screen a broad range of areas for a number of analytical parameters to determine if a contamination problem exists and to define the chemical parameters of concern. Phase II will focus on the parameters found in Phase I and will define the vertical and lateral extent of contamination. Each element of the sampling and analysis program builds upon information derived from the previous elements.

The structuring of the Phase I sampling program accommodates a logical separation of sampling matrices and coordination of various field activities. The separation and timing of the Phase I elements is necessary to allow review of data from previous elements to incorporate minor field changes of specific sampling locations. The timing of Phase I elements has also been developed to accommodate laboratory scheduling. This coordination is necessary to ensure that samples can be extracted and analyzed within the statutory holding times specified by U.S. EPA as documented in the Work Plan.

Table 1 presents a calendar of scheduled site operations. The elements of this field program are discussed individually below along with the rationale incorporated into the development of the

schedule. Table 1 also illustrates the approximate manpower allocation associated with various elements of the field and analytical program.

The Phase I program has been separated into four field elements as discussed below:

Phase I (a)

The Phase I (a) program involves a number of preparatory activities. An initial orientation meeting at the Refuge covered and overview of the site background, sampling program design and schedule, protocols and health and safety practices. Phase I (a) also includes the site safety walk-throughs to be conducted by the Safety Officer, Dr. Kaczmar. Two teams of personnel will begin site operations subsequent to clearance by the Safety Officer.

Six sites which are scheduled for geophysical testing will be gridded and staked in preparation for the field geologist. Garver and Schwalbe will perform this activity. In addition, specific soil sampling locations will be staked at these sites during this time. Subsequent to the staking of geophysical grids, the remaining sites will be staked to establish specific points for sampling. The approximate locations are illustrated in Appendix B of the Work Plan.

The geophysical testing will follow the initial preparatory activities and will be performed by Foresti who will be assisted by Schwalbe. Magnetometer and Electromagnetic readings will be taken along the specified grid locations and appropriately documented.

Lake biota sampling will be conducted concurrent with the geophysical tests. Quirk will provide sample tagging and packaging and will oversee the sampling which is to be conducted by FWS personnel. All biota will be frozen prior to shipping.

Phase I (a) is followed by a period of data review. During this time, the geophysical data will be entered into a computer database for contouring. Review of these contoured data will be accomplished to determine if changes to the planned sampling locations should be made as a result of locations of subsurface anomalies. The geophysical data will also be used to indicate whether additional safety precautions should be followed during the acquisition of soil samples.

Phase I (b)

The Phase I (b) field activities cover a period of three weeks as illustrated on Table 1. Results of the geophysical tests from Phase I (a) are necessary proceeding with Phase I (b).

The majority of samples obtained during Phase I (b) consist of shallow soil samples from a number of study sites. This activity is most efficiently accomplished by two teams working together. The

sampling team is responsible for acquiring and documenting the sampling locations. The sampling team delivers discrete samples to the packaging team who performs any necessary compositing and splits samples for preserving and packaging in appropriate containers. The packaging team also labels sample tags, logs the samples, and prepares the chain-of-custody documentation.

In addition to soils, a number of pond and stream sediments will be acquired during Phase I (b). These will require the use of a boat for sampling.

Concurrent with the acquisition of shallow soil samples, the field geologist will supervise the installation of monitoring wells at five sites. This is expected to cover a period of nine days.

Subsequent to the above activities, both teams will move to the Area 9 Landfill and coordinate the drilling, sampling and packaging at that location. All safety protocols specified in the Work Plan or as modified by the Safety Officer will be followed by personnel working at Area 9.

During Phase I (b) specific sampling locations will be selected for the Area 9 Plant Site 33. These will be staked for location by the drilling and survey crews. Some of these samples are to be acquired to a depth of 1 ft, while other locations will be sampled to a depth of 3 ft. These locations will be documented on a site map and transmitted to Olin personnel. Olin will verify the locations of utility lines to assure that drilling activities do not encounter water, sewer or power lines.

Phase I (c)

Phase I (c) is limited to the acquisition of soil samples from the Area 9 Plant site. Two sampling personnel will work in conjunction with the drilling crew. Shallow samples will be acquired by Schwalbe and Jurgeil, while the drilling crew will be utilized to acquire the deeper samples.

Preparatory to Phase I (d), all of the screening data from Phases I (a) and (b) will be organized and reviewed. The purpose of this interim review is to select specific locations to be resampled for full CLP protocol analyses. To assist this review, a statistical analysis of the screening data will be conducted. This will allow rapid identification of those sites which contain components at concentrations higher than the mean of all sites at the Refuge. The following criteria (in the order listed) are used for the selection of these sites:

- At least one sample is to be taken from each geographic site group irregardless of screening results.
- Screening locations with PCB analyses above average are to be emphasized.

- Screening locations with detectable PCDF/PCDD are to be emphasized.
- Screening locations with FID scans above one standard deviation are to be emphasized.
- Screening locations with detectable explosives residuals are to be emphasized.
- Screening locations with TOX above average are to be emphasized.
- Screening locations with TOC above two standard deviations are to be emphasized.
- Screening locations with organic nitrogen above two standard deviations are to be emphasized.

Phase I (d)

During Phase I (d) several sampling locations will be resampled for full CLP protocol organic analyses. These locations will attempt to match as closely as possible those analogous locations which were sampled for screening. It is the purpose of Phase I (d) to identify a wide array of compounds which may be indicated by the earlier screening sequences. It is therefore necessary that the analytical results from Phases I (a) and (b) be completed before Phase I (d) can begin.

A sampling crew of two (Schwalbe and Jurgiel) will be sufficient to cover the limited sampling required by Phase I (d).

The Phase I (d) results will be used in conjunction with the earlier test results to develop the remainder of the test program. Specifically, the compounds identified and verified by Phase I (d) may be specified for analysis of biological species, lake matrices (water and sediments), as well as the Phase II program for identifying the vertical and lateral extent of contamination. It is necessary for the Phase I (d) analyses to be completed before the subsequent series of sampling and testing can begin.

Analysis of Biological Samples

Biological samples were collected and frozen as a part of Phase I (a). They were collected during the Spring-Summer period at the request of FWS because fish flesh is more likely to demonstrate uptake of contaminants at that time. FWS has indicated that negligible losses of materials occur during freezing if the fish are properly packaged. The analytical parameters specified in the Work Plan may be screening and verification analyses.

Phase II Site Operation Plan

Subsequent to analyses of the Phase I (d) samples, the sampling and analytical program for Phase II can be developed. It is not the purpose of Phase II to analyze a broad array of parameters as in Phase I. Instead, Phase II will focus on a limited number of site indicator parameters which reflect the potential problems at the site. Phase II may involve many more samples at a given site than Phase I, but the specified analyses will be more restricted. More deep samples are also anticipated for Phase II work.

This sampling and analytical program will be proposed in a Phase II Site Operations Plan. This Plan will also include details on planning for the Phase II sampling activities. A copy of this Plan will be provided to U.S. EPA for their comments.

Phase II

The beginning of the Phase II program is timed to coincide with the beginning of warmer weather to facilitate acquisition of samples. In addition, ground water elevation monitoring and sampling will be conducted during the typically high ground water conditions of spring. Information on ground water elevation variability can be developed by comparison to the Phase I monitoring data.

A two-week field period using a crew of 3 to 4 samplers is contemplated. It is also anticipated that a drilling rig will be required to obtain deeper samples. It is not known at this time whether additional wells will be necessary, but if so, they will be installed during the Phase II field program.

Following the analyses of the Phase II samples, the draft Site Investigation report section will be prepared.

Contingency Sampling

It is possible that results from the Phase II analyses may indicate the need for additional sampling and analysis. For example, *unexpected dispersion patterns or localized hot spots may require further definition before the scope of a remedial effort can be determined.* Every attempt will be made to identify such needs as early as possible to avoid delays to the feasibility studies.

C. SAMPLING ORDER

Specific site activity schedules and proposed order of site activity is illustrated on the attached Figures 1 through 8 represent the detail planning for Phases 1A and 1B. In actuality, these schedules will be developed and modified as necessary based on field decisions and contingencies encountered (e.g., inclement weather, equipment breakdown, etc.). Accommodation for some of these contingencies is built into the project schedules.

D. DOCUMENTATION OF SAMPLING LOCATIONS

Proposed sampling locations for each site were documented in the Site Sampling Plan. However, because of the necessity to modify some of those location in the field, it is necessary to document the actual locations sampled. This is to be done in two steps. Initially, all sampling locations are to staked and labelled either prior to sampling or at the time of initial sampling. Subsequent to sampling, the locations of sampling will be surveyed relative to permanent local benchmarks. For those sites where remedial action is likely to be necessary, topographical survey information will be developed as necessary for the remedial options to be considered. The documentation of actual sampling locations will be presented in Status Reports and in the Final RI Report.

E. EQUIPMENT AND SUPPLIES

Specific equipment and supplies required for the Phase I sampling activities are enumerated on Tables 3 and 4, attached. Other preparatory aspects of the sampling program include acquisition or arrangements for the following:

- Field trailer
- Electrical and telephone service for field trailer
- Sample refrigeration facilities
- Air and surface transport of samples to laboratories
- Travel arrangements for field personnel
- Lodging arrangements for field personnel
- Letters of credit for local banks
- Vehicles
- Sample containers

F. DECONTAMINATION

Decontamination protocols are addressed in the Work Plan. See Appendix B of the Work Plan, pages 5 through 7, and Appendix C, pages 11 through 14.

G. DOCUMENTATION

Protocols for documentation of field activities are presented in the Work Plan. See the following:

- Sample Custody: Appendix A, page 5 and Attachment 1, pages 13 through 16.
- Sample Locations and Numbering: Appendix B, pages 2 and 3.
- Field Notes: Appendix B, pages 7 through 10.
- Packaging and Shipping: Appendix C, Attachment 1, Section 5.

TABLE 1

SITE OPERATIONS SCHEDULE
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

| | | | | | | Manpower Allocation (manweeks) | | | | | | |
|--------------|----|--------------|-------------|------------------|-----------------|--------------------------------|-------|-------|-------|-------|-------|-------|
| Week of: | | Mobilization | Field | Laboratory | Data | ===== | | | | | | |
| | | Activity | Activity | Activity | Review | Mobiliz. | Field | Lab | Anal | Data | rev | Total |
| | | ===== | ===== | ===== | ===== | ===== | ===== | ===== | ===== | ===== | ===== | ===== |
| July 1985 | 15 | Phase I (a) | I (a) | Analysis | | 2.0 | 6.5 | | 4.3 | | | 12.8 |
| | 22 | | I (a) | of I (a) | | | 6.5 | | 4.3 | | | 10.8 |
| | 29 | | | samples | Analysis | | | | 4.3 | 1.5 | | 5.8 |
| August | 5 | Phase I (b) | | | of | 2.0 | | | 4.3 | 1.0 | | 7.3 |
| | 12 | | I (b) | Analysis | geophysical | 1.0 | 6.5 | | 4.3 | | | 11.8 |
| | 19 | | I (b) | of I (b) | data | | 7.0 | | 4.3 | | | 11.3 |
| | 26 | | I (b) | samples | | | 6.0 | | 4.3 | 1.0 | | 11.3 |
| September | 2 | | | | Document | | | | 4.3 | 2.0 | | 6.3 |
| | 9 | | | | I (c) locations | | | | 4.3 | 2.0 | | 6.3 |
| | 16 | Phase I (c) | | | Locate | 2.0 | | | 4.3 | | | 6.3 |
| | 23 | | I (c) | | Utilities | | 4.0 | | 4.3 | | | 8.3 |
| October | 30 | | | Analysis | | | | | 6.7 | | | 6.7 |
| | 7 | | | of I (c) | | | | | 2.4 | | | 2.4 |
| | 14 | | | samples | | | | | 2.4 | | | 2.4 |
| | 21 | | | | Final | | | | 2.4 | 1.0 | | 3.4 |
| November | 28 | | | | Selection | | | | 2.4 | 1.0 | | 3.4 |
| | 4 | | | | of I (d) | | | | 2.4 | 2.0 | | 4.4 |
| | 11 | Phase I (d) | | | sampling | 1.0 | | | 2.4 | 2.0 | | 5.4 |
| | 18 | | I (d) | Analysis | locations | | 3.0 | | 13.9 | | | 16.9 |
| December | 25 | | | of I (d) | | | | | 13.9 | 1.0 | | 14.9 |
| | 2 | | | samples | | | | | 13.9 | 1.0 | | 14.9 |
| | 9 | | | | | | | | 13.9 | 1.0 | | 14.9 |
| | 16 | | | | | | | | 13.9 | 1.0 | | 14.9 |
| | 23 | | | | | | | | 13.9 | 1.0 | | 14.9 |
| | 30 | | | | Preparation | | | | 13.9 | 1.0 | | 14.9 |
| | 6 | | | | of Phase II | | | | 13.9 | 1.0 | | 14.9 |
| January 1986 | 13 | | | Analysis of | Site | | | | 11.6 | 2.0 | | 13.6 |
| | 20 | | | biological | Operation | | | | 11.6 | 1.0 | | 12.6 |
| | 27 | | | samples | Plan | | | | 11.6 | 2.0 | | 13.6 |
| February | 3 | | | | | | | | 11.6 | 2.0 | | 13.6 |
| | 10 | | | | Review | | | | 11.6 | | | 11.6 |
| | 17 | | | | and | | | | | 1.0 | | 1.0 |
| | 24 | | | | Approval | | | | | 1.0 | | 1.0 |
| March | 4 | Phase II | | | | 2.0 | | | | 1.0 | | 3.0 |
| | 11 | | II | | | | 3.0 | | | | | 3.0 |
| | 18 | | II | Analysis | | | 3.0 | | 9.5 | | | 12.5 |
| | 25 | | | of Phase II | | | | | 9.5 | 2.0 | | 11.5 |
| April | 1 | | | samples | Preparation | | | | 9.5 | 2.0 | | 11.5 |
| | 8 | | | | of Draft | | | | 9.5 | 2.0 | | 11.5 |
| | 15 | | | | Site | | | | 9.5 | 2.0 | | 11.5 |
| | 22 | | | | Investigation | | | | 9.5 | 2.0 | | 11.5 |
| | 29 | Topo survey | | | Report | 1.0 | 4.0 | | 9.5 | 2.0 | | 16.5 |
| May | 6 | | Contingency | samples and topo | Section | | 4.0 | | | 2.0 | | 6.0 |
| | 13 | | | | | | | | | 2.0 | | 2.0 |
| | 20 | | | Analysis of | | | | | | 2.0 | | 2.0 |
| | 27 | | | Contingency | | | | | | 2.0 | | 2.0 |
| June | 3 | | | Samples | | | | | | 2.0 | | 2.0 |
| | 10 | | | | Submit Draft | | | | | 2.0 | | 2.0 |
| | | | | | | June 15, 1985 | | | | | | |
| | | | | | | 11.0 | 53.5 | 304.1 | 55.5 | | | 424.1 |

TABLE 2
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
FIELD SCHEDULE

| | Date | Team |
|---|---------|----------|
| -Phase Ia (July 15-26) | | |
| -Orientation | 7/15 | ATT |
| -Safety Walk-Through | 7/16-17 | SWK + RW |
| -Geophysical Grid Layout | 7/16-17 | SRG + MS |
| -Geophysical Testing (Sites 29,13,21,17,28,7A,32) | 7/18-24 | RF + MS |
| -Lake Biota sampling | 7/22-24 | FWS + MQ |
| -Waters and sediments | 7/24-26 | MQ + MS |
| -Phase Ib (Aug 12-30) | | |
| -Well Installation | | |
| -Refuge control | 8/12-14 | RF + MS |
| -Job Corps | 8/14 | |
| -Fire Station | 8/14-16 | |
| -Monition Control | 8/16 | |
| -Plating Pond | 8/16-17 | |
| -Water Tower | 8/19-20 | |
| -Area 9 | -- | |
| -Soil Cores (Area 9 LF) | 8/20-30 | DI + MQ |
| -Pond Sediments | | |
| -Acid Pond | 8/12-13 | |
| -Plating Pond | | |
| -Marion LF Pond | | |
| -Job Corps Pond | | |
| -Shallow Soils (scfeen) | | |
| -18,19 | 8/14-15 | |
| -3,4,5 | 8/15-17 | |
| -12,13 | 8/19-20 | |
| -15,16,21 | 8/20-22 | |
| -28 | 8/22-24 | |
| -29 | 8/26-27 | |
| -17 | 8/27 | |
| -7A, 11A | 8/28-30 | |
| -Phase Ic (Sept. 16-20) | | |
| -Shallow Soils (#33 Area 9 Plant) | 9/16-20 | DI + MS |
| -Phase Id (Oct. 7-11) | 10/7-11 | DI + MS |
| -Resampling for full scans (soils, waters, sediments) | | |
| -Phase II (Mar-Apr 86) | | |
| -Arial and depth matrices at contaminated sites (to be determined) | | |
| -Lake waters and sediments | | |

Team members and dates will
be developed and submitted
for review and approval.

| HIT LIST (sub.1) | | NUMBER or AMOUNT per UNIT (person, site, or sample) X | NUMBER OF UNITS | TOTAL NO. = NEEDED | WHERE AVAILABLE (here, St. Louis, etc.) |
|----------------------------------|---|---|--------------------|-----------------------|--|
| SAMPLING EQUIPMENT: | | | | | |
| SITE IDENTIFICATION: | | | | | |
| | 2"x2"x24" wooden stakes..... | 100 | - | 100 | |
| | orange spray paint..... | 2 cans | - | 2 | |
| | rope..... | 400 ft. | - | 400 ft | |
| | hammer..... | 1 | - | 1 | |
| WATER: | waders..... | 2size10; 2size12 | | 4 | |
| | boat..... | 1 | - | 1 | |
| | disposable stirrers..... | | | | |
| | 2" submersible pump..... | | | | |
| | water filtering device..... | | | | |
| | filters..... | | | | |
| | 100 ft. steel tape..... | | | | |
| | shovel..... | | | | |
| | electrical cord..... | | | | |
| | glass funnel..... | | | | |
| | deep buckets..... | | | | |
| | paper towels..... | | | | |
| | plastic sheeting..... | 10'x50'roll | 2 | 2 rolls | |
| | polypropylene rope..... | | | | |
| | silicone spray..... | | | | |
| | flagging tape..... | | | | |
| | electrical tape..... | | | | |
| | aluminum foil..... | 3 rolls | | 3 rolls | |
| | tool kit: phillipshead screwdrivers..... | 3 sizes | | 3 | |
| | wrenches..... | 2 crescent; 2 pipe | | 4 | |
| | hammers..... | (1) 5#; (1) 1/2 claw | | 2 | |
| | knife..... | 1 | | 1 | |
| | pliers..... | 1 handle-nose; 1 reg. | | 2 | |
| | tubing bender..... | (1) 3/8" | | 1 | |
| | tubing cutter..... | 1 | | 1 | |
| | saw..... | 1 | | 1 | |
| | ? automatic cord reeler and lead cord..... | | | | |
| SEDIMENT: | | | | | |
| | aluminum pans..... | 1 dozen | | | |
| | Wildco hand operated core sampler..... | | | | |
| | 2"OD, 1/16" thickness Lexan tubing..... | 8 foot lengths | 25 | 200 ft | |
| | polypropylene scoops..... | 6 | | | |
| | aluminum scoops..... | 6 | | | |
| | disposable spatulas..... | | | | |
| GEOPHYSICAL: | | | | | |
| | pH meters..... | | | | |
| | specific conductance meters..... | | | | |
| | thermometers..... | | | | |
| | magnetometer/electromagnetic induction equipment... | | | | |
| | surveying equipment..... | | | | |
| | water level probe..... | 1 | | 1 | |
| | [sampling trier..... | | | | |
| | [soil auger..... | | | | |
| | [split barrel sampler..... | | | | |
| HANDLING, STORAGE, AND SHIPPING: | | | | | |
| | coolers..... | (10) 20 quart | | 10 | |

| ----- HIT LIST (sub.1) ----- | | NUMBER or AMOUNT per UNIT (person, site, or sample) X | NUMBER OF UNITS = | TOTAL NO. NEEDED | WHERE AVAILABLE (here, St. Louis, etc.) |
|---|--|---|----------------------|---------------------|--|
| sampler jars (see BOTTLES file)..... | | | | | |
| freezer..... | | 1 | | 1 | |
| van with roof rack..... | | 1 | | 1 | |
| dry ice..... | | | | | |
| ice..... | | | | | |
| shipping labels..... | | | | | |
| markers..... | | | | | |
| DOCUMENTATION: | | | | | |
| field notebooks..... | | | | | |
| sample tags..... | | | | | |
| record sheets..... | | | | | |
| chain-of-custody records..... | | | | | |
| camera..... | | 1 | | 1 | |
| 35 mm, color slide film..... | | | | | |
| SA/GC: | | | | | |
| field blanks..... | | | | | |
| duplicate samples..... | | | | | |
| split samples..... | | | | | |
| ignitability field test..... | | | | | |
| SAFETY EQUIPMENT: | | | | | |
| ----- | | | | | |
| GENERAL PERSONAL GEAR (SAFETY LEVELS B, C, AND D): | | | | | |
| calibrated HNU-1101 photoionizing air monitor..... | | | | | |
| pressure demand self-contained breathing apparatus: | | | | | |
| high efficiency organic vapor/particulate/pesti- | | | | | |
| cide cartridge (respiratory safety level C)..... | | | | | |
| rubber safety boots or safety workboots with rubber | | | | | |
| overboots (safety levels B, C, & D)..... | | | | | |
| cotton overalls (level D) or work clothing under | | | | | |
| white tyvek suit (levels B & C)..... | | | | | |
| tyvek or other hood (levels B & C)..... | | | | | |
| cotton gloves (level D) or surgeon's gloves with | | | | | |
| rubber overgloves (levels B & C)..... | | | | | |
| protective eyewear..... | | | | | |
| hard hat (during drilling)..... | | | | | |
| noise protection (during drilling)..... | | | | | |
| 2 way communication..... | | | | | |
| chemical resistant clothing (yellow tyveks, PVC cover- | | | | | |
| alls, or butyl apron) as needed for specific | | | | | |
| tasks..... | | | | | |
| first aid kit and manual..... | | | | | |
| LEVEL A-HIGHEST LEVEL OF RESPIRATORY, SKIN, AND EYE PROTECTION: | | | | | |
| THE ABOVE LIST PLUS:* | | | | | |
| chemical-resistant fully encapsulating suit..... | | | | | |
| chemical-resistant outer and inner gloves..... | | | | | |
| chemical-resistant boots with steel toe and shank.. | | | | | |
| disposable protective suit, gloves, and boots (worn | | | | | |
| over fully encapsulating suit)..... | | | | | |
| LEVEL B: | | | | | |
| THE GENERAL GEAR LIST PLUS:* | | | | | |
| chemical-resistant clothing (coveralls and long- | | | | | |
| sleeved jacket; coveralls; hooded, one or two- | | | | | |
| piece chemical-resistant splash suit; disposable | | | | | |

| HIT LIST (sub.1) | NUMBER or AMOUNT per UNIT (person, site, or sample) X | NUMBER OF UNITS | TOTAL NO. = NEEDED | WHERE AVAILABLE (here, St. Louis, etc.) |
|---|---|--------------------|-----------------------|--|
| chemical-resistant coveralls)..... | | | | |
| chemical-resistant outer and inner gloves..... | | | | |
| chemical-resistant boots with steel toe and shank.. | | | | |
| chemical-resistant disposable outer boots..... | | | | |
| hard-hat with face shield..... | | | | |

LEVEL C:

THE GENERAL GEAR LIST PLUS:*

chemical-resistant clothing (coveralls; hooded, two-piece chemical-resistant splash suit; chemical-resistant hood and apron; disposable, chemical-resistant coveralls).....

chemical-resistant outer and inner gloves.....

chemical-resistant boots with steel toe and shank..

chemical-resistant disposable outer boots.....

hard-hat with face shield.....

escape mask.....

LEVEL D:

THE GENERAL GEAR LIST PLUS:*

boots/shoes: leather or chemical-resistant with steel toe and shank.....

chemical-resistant disposable outer boots.....

hard hat with face shield.....

escape mask.....

safety glasses or chemical splash goggles.....

*MAY INCLUDE MORE SPECIFIC DESCRIPTIONS OF SOME GENERAL LIST ITEMS)

NOTE: Level B protection should be available in the event that the nature and hazards of a site are unknown, and must be further defined by on-site studies. Safety levels can later be modified appropriately.

DECONTAMINATION:

| | | |
|--|-----------|---------|
| brushes..... | 6 | 6 |
| tub..... | | |
| acetone..... | 1 gal | 1 gal |
| hexane..... | 1 gal | 1 gal |
| distilled water..... | 5 gal | 5 gal |
| 55 gallon drums..... | 4 | 4 |
| interference-free, redistilled solvent (eg. acetone or methyl chloride)..... | | |
| detergent..... | | |
| 5 gallon pails..... | | |
| kiddie pool..... | 2 | 2 |
| Gateraid..... | 2 cases | 2 cases |
| fire extinguishers..... | 1 ABC | 1 |
| Jerry jugs..... | (4) 5 gal | 4 |
| plant sprayer..... | 1 10 gal | 1 |
| air horns..... | 2 | 2 |
| plastic garbage cans..... | 2 | 2 |
| scissors..... | 2 pair | 2 pair |
| pocket knives..... | 3 | 3 |
| Janitor-in-a-drum cleaner..... | 1 | 1 |

TABLE 4

| amount | SYRACUSE | check | amount | St. LOUIS | check | amount | REFUGEE/MARION | check |
|--------|-------------------------------|-------|--------|----------------------|-------|--------|------------------------|-------|
| | LAB | | | VAN WITH ROOF RACK | | | BOAT (REFUGEE) | |
| | | | | | | | ICE (MARION) | |
| | SAMPLING JARS (see pages 2&3) | | | DRY ICE | | | DISTILLED WATER | |
| | RECORD SHEETS | | | COOLERS | | | (EITHER AT AN INDUSTRY | |
| | CHAIN-OF-CUSTODY RECORDS | | | ALUMINUM PANS | | | OR FROM SOUTHERN | |
| | DETERGENT | | | PLASTIC PAILS | | | ILLINOIS UNIVERSITY) | |
| | SOLVENT (NANO GRADE): | | | WADERS | | | FREEZER | |
| | ACETONE | | | TOILET BRUSHES | | | STATION WAGON | |
| | HEXANE | | | KIDS POOL | | | | |
| | WATER FILTERING DEVICE | | | GATERAID | | | | |
| | FILTERS | | | FIRE EXTINGUISHER | | | | |
| | DETERGENT | | | JERRY JUGS | | | | |
| | | | | PLANT SPRAYER | | | | |
| | HYDROGEOLOGIC | | | PLASTIC SHEETING | | | | |
| | | | | AIR HORNS | | | | |
| | WATER LEVEL PROBE | | | GARBAGE CANS | | | | |
| | ELECTROMAGNETIC EQUIP'T | | | SCISSORS | | | | |
| | SURVEY EQUIPMENT | | | POCKET KNIVES | | | | |
| | | | | JANITOR-IN-A-DRUM | | | | |
| | SUPPLY | | | ALUMINUM SCOOPS | | | | |
| | | | | POLYPROPYLENE SCOOPS | | | | |
| | SHIPPING LABELS | | | LEXAN TUBING | | | | |
| | MARKERS | | | ROPE | | | | |
| | I. D. STICKERS (RED & YELLOW) | | | HAMMER | | | | |
| | RUBBER BANDS | | | STAKES | | | | |
| | FOLDERS | | | ORANGE PAINT | | | | |
| | | | | ALUMINUM FOIL | | | | |
| | DIV. 3 | | | HACKSAW | | | | |
| | | | | 100 ft. STEEL TAPE | | | | |
| | CAMERA | | | SHOVEL | | | | |
| | COMPUTER SAMPLE LABELS | | | ELECTRICAL CORD | | | | |
| | OH METER | | | GLASS FUNNEL | | | | |
| | SPEC. CONDUCTANCE METER | | | DEEP BUCKETS | | | | |
| | SAFETY EQUIPMENT (see page 4) | | | PAPER TOWELS | | | | |
| | | | | POLYPROPYLENE ROPE | | | | |
| | | | | SILICONE SPRAY | | | | |
| | | | | FLAGGING TAPE | | | | |
| | | | | ELECTRICAL TAPE | | | | |
| | | | | DISPOSABLE SPATULAS | | | | |
| | | | | DISPOSABLE STIRRERS | | | | |
| | | | | THERMOMETERS | | | | |
| | | | | DRUMS | | | | |
| | | | | SQUEEZE BOTTLES | | | | |
| | | | | TUB | | | | |
| | | | | INTERFERENCE-FREE | | | | |
| | | | | REDISTILLED SOLVENT | | | | |

TABLE 4 (cont)

| ANAL. | SET | MATRIX | PARAMETERS | CONTAINERS NEEDED | PRESERVATIVES | TOTAL NO. NEEDED per ANAL. SET |
|-------|----------|--------------------------------|-----------------|---|--------------------------------|--------------------------------------|
| A | SED/SOIL | | purgeables | 30 ml crimp vial | FILL 1/2 WAY | 135 |
| | | | all others | 1 qt glass jar with teflon-lined cap | | 135 |
| | | | explosives | 60 ml glass jar | KEEP MOIST | 135 |
| | | | ICP | 1/2 pt glass jar | | 135 |
| | | | compositing | aluminum pans | | 135 |
| | | | | | | |
| | | | Purgeables | (2) 40ml screwcap vials | | 118 |
| | | | acid/base | 1 l glass with teflon-lined cap | | 59 |
| | | | ICP | 1/2 pt plastic with plastic cap | | 59 |
| | | | mercury | 1/2 pt plastic | CONC. HNO ₃ | 59 |
| | | | CN | 1 pt plastic | CAUSTIC PELLETS | |
| | | | TOC, N, & phos. | 1 pt plastic | H ₂ SO ₄ | 59 |
| | | | TOX | 125ml screwcap glass | THIOSULFATE | 59 |
| | | | explosives | 100 ml plastic | KEEP MOIST | 59 |
| B | SED/SOIL | | compositing | 1 gal glass jar with plastic top | | 59 |
| | | | | | | |
| | | | PCB'S | 1 qt glass jar with teflon-lined cap | | 238 |
| | | | | | | |
| | | | all | 1 qt glass jar with teflon-lined cap | | 31 |
| | | | compositing | aluminum pans | | 31 |
| | | | | | | |
| | | | purgeables | 30 ml crimp vial | FILL 1/2 WAY | 31 |
| | | | all others | 1 qt glass jar with teflon-lined cap | | 31 |
| | | | explosives | 60 ml glass jar | KEEP MOIST | 31 |
| | | | ICP | 1/2 pt glass jar | | 31 |
| | | | compositing | aluminum pans | | 31 |
| | | | | | | |
| | | | | | | |
| E | WATER | prim. & sec. D.W. standards | | 1 pt plastic jar | NITRIC ACID | 6 |
| | | | | 1 pt plastic jar | | 6 |
| | | | | 1 qt glass jar | | |
| | | | | with teflon-liner | | 6 |
| | | | | 1 qt glass jar | ACID WASHED | 6 |
| | | | | | | |
| F | SED/SOIL | FULL ANALYSIS | | as in A | | 23 |
| | | | | | | |
| | WATER | FULL ANALYSIS | | as in A | | 12 |
| | | | | | | |
| G | SED/SOIL | FULL ANALYSIS | | as in D | | 11 |
| | | | | | | |
| H | SED/SOIL | FULL ANALYSIS | | as in C | | 7 |
| | | | | | | |

TABLE 4 (cont)

| CONTAINER SUMMARY | | |
|-------------------|---------------------|----------|
| SIZE | TYPE OF CONTAINER | QUANTITY |
| 30 ml | crimo vial | 200 |
| 1 quart | glass jar | 448 |
| 60 ml | glass jar | 200 |
| 1/2 pt | glass jar | 200 |
| 40 ml | glass screwcap vial | 130 |
| 1 liter | glass jar | 71 |
| 1/2 pt | plastic bottle | 142 |
| | with plas. cap | 71 |
| 1 pt | plastic bottle | 154 |
| 125 ml | glass screwcap vial | 71 |
| 100 ml | plastic bottle | 71 |
| 1 gal | glass w/plas.cao | 71 |
| | aluminum pans | 238 |
| | teflon-liners | 553 |

TABLE 4 (cont)

| AMOUNT | SAFETY EQUIPMENT | CHECK |
|--------|--|-------|
| | GENERAL PERSONAL GEAR (SAFETY LEVELS B, C, AND D): | |
| | calibrated HNU-1101 photoionizing air monitor..... | |
| | pressure demand self-contained breathing apparatus; | |
| | high efficiency organic vapor/particulate/pesti- | |
| | cide cartridge (respiratory safety level C)..... | |
| | rubber safety boots or safety workboots with rubber | |
| | overboots (safety levels B, C, & D)..... | |
| | cotton overalls (level D) or work clothing under | |
| | white tyvek suit (levels B & C)..... | |
| | tyvek or other hood (levels B & C)..... | |
| | cotton gloves (level D) or surgeon's gloves with | |
| | rubber overgloves (levels B & C)..... | |
| | protective eyewear..... | |
| | hard hat (during drilling)..... | |
| | noise protection (during drilling)..... | |
| | 2 way communication..... | |
| | chemical resistant clothing (yellow tyveks, PVC cover- | |
| | alls, or butyl apron) as needed for specific | |
| | tasks..... | |
| | first aid kit and manual..... | |
| | SAFETY LEVEL A: HIGHEST LEVEL OF SKIN, EYE, AND RESPI- | |
| | RATORY PROTECTION: | |
| | THE ABOVE LIST PLUS:* | |
| | chemical-resistant fully encapsulating suit..... | |
| | chemical-resistant outer and inner gloves..... | |
| | chemical-resistant boots with steel toe and shank.. | |
| | disposable protective suit, gloves, and boots (worn | |
| | over fully encapsulating suit)..... | |
| | SAFETY LEVEL B: | |
| | THE GENERAL GEAR LIST PLUS:* | |
| | chemical-resistant clothing (coveralls and long- | |
| | sleeved jacket; coveralls; hooded, one or two- | |
| | piece chemical-resistant splash suit; disposable | |
| | chemical-resistant coveralls)..... | |
| | chemical-resistant outer and inner gloves..... | |
| | chemical-resistant boots with steel toe and shank.. | |
| | chemical-resistant disposable outer boots..... | |
| | hard-hat with face shield..... | |
| | SAFETY LEVEL C: | |
| | THE GENERAL GEAR LIST PLUS:* | |
| | chemical-resistant clothing (coveralls; hooded, two- | |
| | piece chemical-resistant splash suit; chemical- | |
| | resistant hood and apron; disposable, chemical- | |
| | resistant coveralls)..... | |
| | chemical-resistant outer and inner gloves..... | |
| | chemical-resistant boots with steel toe and shank.. | |
| | chemical-resistant disposable outer boots..... | |
| | hard-hat with face shield..... | |
| | escape mask..... | |
| | SAFETY LEVEL D: | |
| | THE GENERAL GEAR LIST PLUS:* | |
| | boots/shoes: leather or chemical-resistant with | |
| | steel toe and shank..... | |
| | chemical-resistant disposable outer boots..... | |
| | hard hat with face shield..... | |
| | escape mask..... | |
| | safety glasses or chemical splash goggles..... | |
| | (MAY INCLUDE MORE SPECIFIC DESCRIPTIONS OF GENERAL | |
| | LIST ITEMS) | |

| AREA | SITE NO. : SITE DESCRIPTION | AREA | (DAYS) | | | | | | | | | | |
|------|--------------------------------|-----------|--------|---|---|----|-------|---|---|-------|---|-------|----|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| #1 | 3:AREA 11 SOUTH LANDFILL | ? | * | . | . | . | . | . | . | . | . | . | . |
| | 4:AREA 11 NORTH LANDFILL | | . | . | . | . | . | . | . | . | . | . | . |
| | 5:AREA 11 ACID POND | | . | . | . | . | . | . | . | . | . | . | . |
| #2 | 7A:D AREA NORTH LAWN | 1.4 ACRES | . | * | . | . | . | . | . | . | . | . | . |
| | 11A:P AREA NORTH | | . | . | . | . | . | . | . | . | . | . | . |
| | 7:D AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . |
| | 8:D AREA SOUTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . |
| | 9:D AREA NORTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . |
| | 10:WATERWORKS NORTH DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . |
| | 11:P AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . |
| | 20:D AREA SOUTH | | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . |
| #3 | 12:AREA 14 LANDFILL | 0.4 ACRES | . | . | . | . | . | . | . | . | . | . | . |
| | 13:AREA 14 CHANGE HOUSE SITE | | . | . | * | . | . | . | . | . | . | . | . |
| | 14:AREA 14 SOLVENT STORAGE | | . | . | . | . | . | . | . | . | . | . | . |
| #4 | 15:AREA 7 PLATING POND | | . | . | . | . | . | . | . | . | . | . | . |
| | 16:AREA 7 INDUSTRIAL SITE | | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . |
| #5 | 17:JOB CORPS LANDFILL | 0.9 ACRES | . | . | . | */ | . | . | . | . | . | . | . |
| #6 | 18:AREA 13 LOADING PLATFORM | | . | . | . | . | . | . | . | . | . | . | . |
| | 19:AREA 13 BUNKER HOUSE 1-3 | | . | . | . | . | . | . | . | . | . | . | . |
| | 30:MUNITIONS CONTROL SITE | | . | . | . | . | . | . | . | . | . | . | . |
| #7 | 21:SOUTHEAST CORNER FIELD | 0.6 ACRES | . | . | . | . | /*/ | . | . | . | . | . | . |
| #8 | 22:OLD REFUGE SHOP | | . | . | . | . | . | . | . | . | . | . | . |
| | 24:PEPSI-WEST | | . | . | . | . | . | . | . | . | . | . | . |
| | 25:C.O. CREEK AT MARION LF | | . | . | . | . | . | . | . | . | . | . | . |
| | 26:C.O. CREEK BELOW MARION STP | | . | . | . | . | . | . | . | . | . | . | . |
| | 27:C.O. CREEK BELOW 157 DREDGE | | . | . | . | . | . | . | . | . | . | . | . |
| #9 | 28:WATER TOWER LANDFILL | 2.1 ACRES | . | . | . | . | /**** | . | . | . | . | . | . |
| #10 | 29:FIRE STATION LANDFILL | 2.4 ACRES | . | . | . | . | . | . | . | ****/ | . | . | . |
| #11 | 32:AREA 9 LANDFILL | ? | . | . | . | . | . | . | . | . | . | /**** | . |
| | 33:AREA 9 BUILDING COMPLEX | | . | . | . | . | . | . | . | . | . | . | . |

FIGURE 1

/ = ending or beginning
on half day

TEAM ONE: MAGNETOMETER/RADAR SURVEY: JULY

| AREA | SITE NO. : SITE DESCRIPTION | AREA | (DAYS) | | | | | | | | | | |
|------|-----------------------------|------|--------|---|---|---|---|---|---|---|---|----|----|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| #12 | 34:CRAB ORCHARD LAKE | | . | . | . | . | . | . | . | . | . | . | . |
| #13 | 31:REFUGE CONTROL SITE | | . | . | . | . | . | . | . | . | . | . | . |

FIGURE 2

| AREA | SITE NO. : SITE DESCRIPTION | SAMPLE TYPE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|------------------------------|---------------------------|---|---|---|---|---|---|---|---|---|----|
| #1 | 3:AREA 11 SOUTH LANDFILL | SEDIMENT:2 COMP.;20 GRABS | * | . | . | . | . | . | . | . | . | . |
| | 4:AREA 11 NORTH LANDFILL | SEDIMENT:1 COMP.;6 GRABS | * | . | . | . | . | . | . | . | . | . |
| | 5:AREA 11 ACID POND | SEDIMENT:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . |
| #2 | 7A:D AREA NORTH LAWN | | . | . | . | . | . | . | . | . | . | . |
| | 11A:P AREA NORTH | SEDIMENT:4 COMP.;19 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 7:D AREA SOUTHEAST DRAINAGE | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 8:D AREA SOUTHWEST DRAINAGE | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 9:D AREA NORTHWEST DRAINAGE | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 10:WATERWORKS NORTH DRAINAGE | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 11:P AREA SOUTHEAST DRAINAGE | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| #3 | 20:D AREA SOUTH | SEDIMENT:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | * | . | . | . | . | . | . | . | . |
| | 12:AREA 14 LANDFILL | SEDIMENT:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . |
| #4 | 13:AREA 14 CHANGE HOUSE SITE | | . | . | . | . | . | . | . | . | . | . |
| | 14:AREA 14 SOLVENT STORAGE | SEDIMENT:2 COMP.;12 GRABS | * | . | . | . | . | . | . | . | . | . |
| | | WATER:2 COMP.;12 GRABS | * | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| #5 | 15:AREA 7 PLATING POND | SEDIMENT:1 COMP.;4 GRABS | . | . | * | . | . | . | . | . | . | . |
| | | WATER:1 COMP.;4 GRABS | . | . | * | . | . | . | . | . | . | . |
| | 16:AREA 7 INDUSTRIAL SITE | SEDIMENT:4 COMP.;8 GRABS | . | . | * | . | . | . | . | . | . | . |
| | | WATER:4 COMP.;8 GRABS | . | . | * | . | . | . | . | . | . | . |
| #6 | | | . | . | . | . | . | . | . | . | . | . |
| | 17:JOB CORPS LANDFILL | WATER:SINGLE SAMPLING | . | . | * | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| #7 | 18:AREA 13 LOADING PLATFORM | | . | . | . | . | . | . | . | . | . | . |
| | 19:AREA 13 BUNKER HOUSE 1-3 | | . | . | . | . | . | . | . | . | . | . |
| | 30:MUNITIONS CONTROL SITE | | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| #8 | 21:SOUTHEAST CORNER FIELD | | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . |
| | 22:OLD REFUGE SHOP | SEDIMENT:1 COMP.;2 GRABS | . | . | . | * | . | . | . | . | . | . |

FIGURE 3

TEAM ONE AND TWO: WATER AND SEDIMENT SAMPLING: JULY

| AREA | SITE NO. : SITE DESCRIPTION | SAMPLE TYPE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|--------------------------------|----------------------------|---|---|---|---|---|---|---|---|---|----|
| | | WATER:SINGLE SAMPLING | . | . | . | * | . | . | . | . | . | . |
| | 24:PEPSI-WEST | SEDIMENT:SINGLE GRAB | . | . | . | * | . | . | . | . | . | . |
| | | WATER:SINGLE GRAB | . | . | . | * | . | . | . | . | . | . |
| | 25:C.O. CREEK AT MARION LF | SEDIMENT:3 COMP.;9 GRABS | . | . | . | * | . | . | . | . | . | . |
| | | WATER:3 COMP.;9 GRABS | . | . | . | * | . | . | . | . | . | . |
| | 26:C.O. CREEK BELOW MARION STP | SEDIMENT:2 COMP.;6 GRABS | . | . | . | * | . | . | . | . | . | . |
| | | WATER:2 COMP.;6 GRABS | . | . | . | * | . | . | . | . | . | . |
| | 27:C.O. CREEK BELOW 157 DREDGE | SEDIMENT:1 COMP.;3 GRABS | . | . | . | * | . | . | . | . | . | . |
| | | WATER:1 COMP.;3 GRABS | . | . | . | * | . | . | . | . | . | . |
| #9 | 28:WATER TOWER LANDFILL | | . | . | . | . | . | . | . | . | . | . |
| #10 | 29:FIRE STATION LANDFILL | SEDIMENT | . | . | . | . | . | . | . | . | . | . |
| #11 | 32:AREA 9 LANDFILL | SEDIMENT:18 SINGLE SAMP. | . | . | . | . | * | * | . | . | . | . |
| | 33:AREA 9 BUILDING COMPLEX | | . | . | . | . | . | . | . | . | . | . |
| #12 | 34:CRAB ORCHARD LAKE | SEDIMENT:10 COMP.;35 GRABS | . | . | . | . | . | . | . | . | . | . |
| | | WATER:5 SINGLE SAMPLINGS | . | . | . | . | . | . | * | * | . | . |
| #13 | 31:REFUGE CONTROL SITE | | . | . | . | . | . | . | . | . | . | . |

FIGURE 4

TEAM ONE: WELL DRILLING: AUGUST

(DAYS)

| AREA | SITE #: SITE DESCRIPTION | # OF WELLS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | | | |
|------|--------------------------------|------------|----|---------|---|---|---|---|---|-----|--------|----|----|----|---------|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|
| #1 | 3:AREA 11 SOUTH LANDFILL | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 4:AREA 11 NORTH LANDFILL | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 5:AREA 11 ACID POND | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #2 | 7A:D AREA NORTH LAWN | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 11A:P AREA NORTH | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 7:D AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 8:D AREA SOUTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 9:D AREA NORTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 10:WATERWORKS NORTH DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 11:P AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 20:D AREA SOUTH | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #3 | 12:AREA 14 LANDFILL | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 13:AREA 14 CHANGE HOUSE SITE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 14:AREA 14 SOLVENT STORAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #4 | 15:AREA 7 PLATING POND | 1 | #/ | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 16:AREA 7 INDUSTRIAL SITE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #5 | 17:JOB CORPS LANDFILL | 4 | . | /*****/ | | | | | | | | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #6 | 18:AREA 13 LOADING PLATFORM | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 19:AREA 13 BUNKER 1-3 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 30:MUNITIONS CONTROL SITE | 1 | . | . | . | . | . | . | . | /// | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #7 | 21:SOUTHEAST CORNER FIELD | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #8 | 22:OLD REFUGE SHOP | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 24:PEPSI WEST | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 25:C.O. CREEK AT MARION LF | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 26:C.O. CREEK BELOW MARION STP | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | 27:C.O. CREEK BELOW 157 DREDGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #9 | 28:WATER TOWER LANDFILL | 2 | . | . | . | . | . | . | . | . | /****/ | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #10 | 29:FIRE STATION LANDFILL | 4 | . | . | . | . | . | . | . | . | . | . | . | . | /*****/ | | | | | | | | | | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |
| #11 | 32:AREA 9 LANDFILL | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | /*****/ | | | | | . | . | . | | |
| | 33:AREA 9 BUILDING COMPLEX | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | | | |

FIGURE 5

/ = ending or beginning
on half day

| | | TEAM ONE: WELL DRILLING: AUGUST | | | | | | | | | | | | | | | | | | | | | | | | |
|------|--------------------------|---------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|
| | | (DAYS) | | | | | | | | | | | | | | | | | | | | | | | | |
| AREA | SITE #: SITE DESCRIPTION | # OF WELLS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| #12 | 34:CRAB ORCHARD LAKE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #13 | 31:REFUGE CONTROL SITE | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | /****/ |

/****/

| AREA | SITE #:SITE DESCRIPTION | SAMPLE TYPE | (DAYS) | | | | | | | | | | | | | | | | | | | |
|------|--------------------------------|------------------------|--------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| #1 | 3:AREA 11 SOUTH LANDFILL | SOIL:3 COMP.;16 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 4:AREA 11 NORTH LANDFILL | SOIL:1 COMP.;6 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 5:AREA 11 ACID POND | SOIL:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #2 | 7A:D AREA NORTH LAWN | SOIL:16 COMP.;64 GRABS | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 11A:P AREA NORTH | SOIL:4 COMP.;10 GRABS | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 7:D AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 8:D AREA SOUTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 9:D AREA NORTHWEST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 10:WATERWORKS NORTH DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 11:P AREA SOUTHEAST DRAINAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 20:D AREA SOUTH | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #3 | 12:AREA 14 LANDFILL | SOIL:1 COMP.;4 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 13:AREA 14 CHANGE HOUSE SITE | SOIL:6 COMP.;60 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 14:AREA 14 SOLVENT STORAGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #4 | 15:AREA 7 PLATING POND | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 16:AREA 7 INDUSTRIAL SITE | SOIL:9 COMP.;54 GRABS | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #5 | 17:JOB CORPS LANDFILL | SOIL:7 COMP.;29 GRABS | . | . | * | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #6 | 18:AREA 13 LOADING PLATFORM | SOIL:4 COMP.;44 GRABS | . | . | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 19:AREA 13 BUNKER 1-3 | SOIL:5 COMP.;55 GRABS | . | . | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 30:MUNITIONS CONTROL SITE | SOIL:SINGLE SAMPLING | . | . | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #7 | 21:SOUTHEAST CORNER FIELD | SOIL:4 COMP.;24 GRABS | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #8 | 22:OLD REFUGE SHOP | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 24:PEPSI WEST | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 25:C.O. CREEK AT MARION LF | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 26:C.O. CREEK BELOW MARION STP | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 27:C.O. CREEK BELOW 157 DREDGE | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #9 | 28:WATER TOWER LANDFILL | SOIL:6 COMP.;44 GRABS | . | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

TEAM TWO: SOIL AND BIOTA SAMPLING; AUGUST

| AREA | SITE #:SITE DESCRIPTION | SAMPLE TYPE | (DAYS) | | | | | | | | | | | | | | | | | | | |
|------|----------------------------|----------------------------|--------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| #10 | 29:FIRE STATION LANDFILL | SOIL:7 COMP.;84 GRABS | . | . | . | . | * | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #11 | 32:AREA 9 LANDFILL | SOIL:42 COMP.; | . | . | . | . | . | * | * | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 33:AREA 9 BUILDING COMPLEX | SOIL:201 COMP.; | . | . | . | . | . | . | * | * | * | * | * | * | * | * | . | . | . | . | . | . |
| #12 | 34:CRAB ORCHARD LAKE | BIOTA:2 COMP.;16 SPECIMENS | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | * | * | * | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| #13 | 31:REFUGE CONTROL SITE | SOIL:SINGLE SAMPLING | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

FIGURE 8

WORK PLAN SUPPLEMENT
ATTACHMENT S-6
DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
SANGAMO-WESTON, INC.

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

A. DATA MANAGEMENT FOR SCOPING

Site Background

A documentation titled Review of Available Information, dated March 1985, is included as Attachment S-7 to the Work Plan Supplement. All of the historic and background documents which are cited in this Review are filed for retrieval using the reference numbers cited in the Review document. In addition, a computer database of summaries of each of these documents is also in this file and is reproduced as an Appendix to the Review document. This summary database may be searched or sorted using a variety of selection criteria.

Site Chronology

The same database cited above was used to develop a site chronology of records and correspondence. The list of document summaries included in the Appendix to the Review document is arranged chronologically.

Site Maps

All site maps and aerial photos used for this project are located in the flat file document center under the project designation 3114.001.

Site-specific Plans

All site-specific plans including the Quality Assurance Project Plan (QAPP), the Site Sampling Plan (SSP), the Site Health and Safety Plan (SHSP) and the Site Operations Plans (SOPs) are maintained as Appendices to the Work Plan. All information leading to the development of these plans are referenced in or maintained as part of the Work Plan File.

B. DATA MANAGEMENT FOR SITE CHARACTERIZATION AND SAMPLING

Data management procedures and protocols are covered in many places throughout the Work Plan. The attached discussions provide references to specific data management practices and further illustrate some of the forms and outputs used for this project.

Field Data Records and Logs

Field data records and logs are discussed in the Work Plan on pages 5 and 7 through 13 for various field activities. Field records are discussed in additional detail in the QAPP, Appendix A to the Work Plan, on pages 5 (sample custody) and in the SSP, Appendix B to the Work Plan, on pages 7 through 10 (site location procedure, photographs, field notebooks, control of contaminated sampling materials and sample

control). Field safety recordkeeping is discussed in the SHSP, Appendix C to the Work Plan, in Section 3 (protocols for routine activities) and in the Safety Manual, Attachment 1 to the SHSP (See Sections IV and V). Attachment S-6D illustrates the type of information typically included in the field log.

Sample Tagging and Identification

Sample tagging and identification are discussed in the SSP, Appendix C to the Work Plan, pages 1 through 3 and Attachment 2, pages 49 and 50. Sample identification numbers and descriptive information for each proposed sampling location are presented in the SSP, Attachment 1, along with the site descriptions and rationale for sampling. The sample tagging and identification system used for this project is designed to be compatible with O'Brien & Gere's laboratory data management system. The laboratory data management system (see below) used a specific sample number for each sample and permits each number to be accompanied by a series of user-defined identifiers. Identifiers used for this project are shown on Attachment S-6A, along with information on date of sampling and cross-references to duplicate, spike and split samples. This laboratory data management system is also used to generate pre-printed sample tags which are used in the field (see the SSP, page 2). An example of the sample tags is reproduced as Attachment S-6B.

Chain of Custody Documentation

Chain of custody documentation is discussed in the QAPP, Attachment 4, pages 13 through 15, the SSP, page 10 and Attachment 2, pages 50 through 54, and the SHSP, Attachment 1, Section V. The laboratory data management system was used to generate preprinted sample lists which were used as the Chain of Custody documents. See Attachment S-6D for an example.

Laboratory Data Management and Records

The laboratory data management and recordkeeping systems are discussed throughout Attachment 4 of the QAPP (see especially pages 9 through 16). For this project, some additional laboratory data management procedures have been implemented. Attachment S-6E illustrates output from the laboratory scheduling system for Crab Orchard Refuge samples. Attachment S-6F is a summary of analyses completed.

Quality Control Documentation

Documentation of quality control is discussed in Section VI of Attachment 4 of the QAPP (see pages 19 through 31 and the attached Figures 4 through 8). These records are maintained by O'Brien & Gere's laboratory under the project file number 3114.001.

Audit Records and Procedures

Audit procedures are covered on pages 9 and 10 of the QAPP. Specific samples which were acquired for split sample analysis by FWS are cited in the Status Reports covering descriptions of sampling activities.

C. DATA MANAGEMENT FOR HEALTH AND SAFETY PROGRAMS

Statement of Policy

O'Brien & Gere's safety policies are cited in Section I and II of the Safety Manual (Attachment 1 of the SHSP).

Medical Surveillance, Insurance and Training

All employees who engage in hazardous waste site field investigations must complete a comprehensive health examination as stated in Section III of Attachment 1 of the SHSP. These records are maintained by O'Brien & Gere's personnel department. Memoranda of general training programs covering use of protective clothing, respirators, etc. are maintained in O'Brien & Gere's divisional personnel file. Specific supplemental training for this project is documented by the Project Health and Safety Officer and maintained in the project file (3114.001).

Management Plan

Safety responsibilities and authorities are cited in Section II of Attachment 1 of the SHSP. In addition, project personnel responsibilities associated with this project are outlined on Attachment 2 to the QAPP.

Equipment Maintenance

Safety equipment is maintained for ready use by O'Brien & Gere's Business Administration Division which maintains records of this maintenance. Equipment is tested at the home office prior to use in the field.

Emergency Response Procedures

Emergency information for field use is included in Section 4 of the SHSP. Incident Reports are filed by the field supervisor.

D. DATA MANAGEMENT FOR INSTITUTIONAL ISSUES

Site Access

Site access is controlled by FWS personnel for limited-access areas of the Refuge. In addition, records of personnel entry and exit to study sites are incorporated in the field logs.

Community Relations

Records of community relations activities are maintained by the Refuge Manager.

Coordination

Records of coordination among various governmental agencies are maintained as memoranda or letters documenting meetings and communications in addition to the Cooperative Agreement between U.S. FWS and U.S. EPA.

E. DATA MANAGEMENT FOR BENCH- AND PILOT-SCALE STUDIES

Work Plan Supplement

Subsequent to the completion of the Remedial Investigation Report, a Work Plan Supplement will be developed to present details of recommendations for bench- or pilot scale testing to evaluate alternative technologies suggested as a result of the Task 4 activities. This Work Plan will be submitted to U.S. FWS and U.S. EPA and will include the following elements:

- Statement of Objectives
- Quality Control and Quality Assurance
- Data Management
- Criteria for Technology Selection or Elimination

ATTACHMENT S-6A

CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SAMPLING AND ANALYSIS

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

SITE LIST

GRP

#1 3:AREA 11 SOUTH LANDFILL
#1 4:AREA 11 NORTH LANDFILL
#1 5:AREA 11 ACID POND
#2 7A:D AREA NORTH LAWN
#2 11A:P AREA NORTH
#2 7:D AREA SOUTHEAST DRAINAGE
#2 8:D AREA SOUTHWEST DRAINAGE
#2 9:D AREA NORTHWEST DRAINAGE
#2 10:WATERWORKS NORTH DRAINAGE
#2 11:P AREA SOUTHEAST DRAINAGE
#2 20:D AREA SOUTH
#3 12:AREA 14 LANDFILL
#3 13:AREA 14 CHANGE HOUSE SITE
#3 14:AREA 14 SOLVENT STORAGE
#4 15:AREA 7 PLATING POND
#4 16:AREA 7 INDUSTRIAL SITE
#5 17:JOB CORPS LANDFILL
#6 18:AREA 13 LOADING PLATFORM
#6 19:AREA 13 BUNKER 1 -3
#6 30:MUNITIONS CONTROL SITE
#7 21:SOUTHEAST CORNER FIELD
#8 22:OLD REFUGE SHOP
#8 24:PEPSI -WEST
#8 25:C.O. CREEK AT MARION LF
#8 26:C.O. CREEK BELOW MARION STP
#8 27:C.O. CREEK BELOW 157 DREDGE
#9 28:WATER TOWER LANDFILL
#10 29:FIRE STATION LANDFILL
#11 32:AREA 9 LANDFILL
#11 33:AREA 9 BUILDING COMPLEX
#11 35:AREA 9 EAST WATERWAY
#12 34:CRAB ORCHARD LAKE
#13 31:REFUGE CONTROL SITE

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

SAMPLING & ANALYSIS SCHEDULE

KEY

1. ID1 - Site Number
2. ID2 - Sequential number at a given site
3. ID3 - Sample Matrix: Soil-1; water-2; sediment-3; fish-4; turtles-5; crayfish-6
4. ID4 - Analysis set: A-1; B-2; C-3; D-4; E-5; F-6; G-7; H-8
(see parameter list for analysis sets)
5. MATRIX- soil, water, etc. (See ID3)
6. Name - Description of sampling locations
7. Type - Type of sample collection - surface, grab, composite, core, etc.
8. Depth- Depth at which sample is collected
9. Analysis set - See Parameter List for analysis sets
10. Sample No. - Sequential numbering for site use.
11. Lab No. - Number used by OB&G Laboratory System
12. Replicate - Shows if replicates are collected for FWS, duplicates or spikes
13. Sample Coll. Date - Date of sampling -
'***' indicates sample collected; '---' indicates sample not collected
14. Dupl/spike Numbers - Lab No. for corresponding duplicate or spike sample

PARAMETER LIST FOR ANALYSIS SETS

| PARAMETERS | ANALYSIS SET | | | | | | | | |
|--|--------------|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I |
| 1. Purgeable Priority Pollutants | -Screen | x | - | - | x | - | - | - | - |
| -Full Anal. | - | - | - | - | - | x | x | x | - |
| 2. Acid Extract. Priority Pollutants | -Screen | x | - | - | x | - | - | - | - |
| -Full Anal. | - | - | - | - | - | x | x | x | - |
| 3. Base/Neutral Extract. Prior. Poll. | -Screen | x | - | - | x | - | - | - | - |
| -Full Anal. | - | - | - | - | - | x | x | x | x |
| 4. Pesticide/PCB Priority Pollutants | -Screen | x | - | - | x | - | - | - | - |
| -Full Anal. | - | - | - | - | - | x | x | x | x |
| 5. PCB's | - | x | x | - | - | - | - | - | - |
| 6. Metals - ICP Scan | -Screen | x | - | - | x | - | - | x | x |
| - Prior. Poll. scan by AA | -Full Anal. | - | - | - | - | - | - | - | - |
| - Mercury | - | x | - | - | x | - | - | x | x |
| 7. Cyanide 40 | - | x | - | - | x | - | - | x | x |
| 8. Indicators | | | | | | | | | |
| - pH (field) | x | - | x | x | - | - | - | x | - |
| - Specific Conductance (field) | x | - | x | x | - | - | - | x | - |
| - Total Organic Carbon | x | - | x | x | - | - | - | x | - |
| - Total Organic Halogen | x | - | x | x | - | - | - | x | - |
| 9. Explosives Residues by HPLC | x | - | - | x | - | - | - | x | - |
| 10. Nitrogen Series: TKN, NH3, NO3 | x | - | x | x | - | - | - | x | - |
| 11. PCDD/PCDF | -Screen | - | - | x | x | - | - | - | - |
| -Full Anal. | - | - | - | - | - | - | x | x | - |
| 12. Cation Exchange Capacity | - | - | x | - | - | x | x | - | - |
| 13. Total Phosphorus | x | - | - | x | - | - | - | x | - |
| 14. Primary & Secondary Drinking Water Stds. | - | - | - | - | x | - | - | - | - |
| 15. Percent Solids (on soil/sed only) | x | x | x | x | - | x | x | x | x |

NOTE: Procedures for Screening & Full Analyses are referenced in the Work Plan

TOTAL UNIT COSTS for SETS F, G and H reflect additional costs for full analysis

SET F is full analysis of parameters screened in SET A

SET G is full analysis of parameters screened in SET D

SET H is full analysis of selected samples instead of SET D

SET I is full analysis of selected samples for Phase II

LIST OF CHEMICAL COMPOUNDS FOR ANALYSIS

PURGEABLE PRIORITY POLLUTANTS

| | | |
|---------------------------|------------------------------|----------------------------|
| 1 Chloromethane | 15 1,2-Dichloropropane | 29 1,1 Dichloroethylene |
| 2 Bromomethane | 16 t-1,3-Dichloropropene | 30 t-1,2-Dichloroethylene |
| 3 Dichlorodifluoromethane | 17 Trichloroethene | 31 Bromochloromethane |
| 4 Vinyl chloride | 18 Benzene | 32 Trichloroethylene |
| 5 Chloroethane | 19 Dibromochloromethane | 33 2-Bromo-1-chloropropane |
| 6 Methylene Chloride | 20 1,1,2-Trichloroethane | 34 Tetrachloroethylene |
| 7 Trichlorofluoromethane | 21 c-1,3-Dichloropropene | 35 Acetone |
| 8 1,1-Dichloroethene | 22 2-Chloroethylvinyl ether | 36 Carbon disulfide |
| 9 1,1-Dichloroethane | 23 Bromoform | 37 2-Butanone |
| 10 t-1,1-Dichloroethene | 24 1,1,2,2-Tetrachloroethane | 38 Vinyl acetate |
| 11 Chloroform | 25 Tetrachloroethene | 39 2-Hexanone |
| 12 1,1,1-Trichloroethane | 26 Toluene | 40 4-Methyl-2-pentanone |
| 13 Carbon tetrachloride | 27 Chlorobenzene | 41 Styrene |
| 14 Bromodichloromethane | 28 Ethylbenzene | 42 Total xylenes |

ACID EXTRACTABLE PRIORITY POLLUTANTS

| | | |
|----------------------|---------------------------|-------------------------------|
| 1 Phenol | 6 2-Nitrophenol | 11 Pentafluorophenol |
| 2 o6-Phenol | 7 4-Nitrophenol | 12 2,4,6-Trichlorophenol |
| 3 2-Fluorophenol | 8 4-Chloro-3-methylphenol | 13 2-Methyl-4,6-dinitrophenol |
| 4 2,4-Dimethylphenol | 9 2,4-Dichlorophenol | 14 Pentachlorophenol |
| 5 2-Chlorophenol | 10 2,4-Dinitrophenol | |

BASE/NEUTRAL PRIORITY POLLUTANTS

| | | |
|---------------------------------|--------------------------------|---------------------------------|
| 1 1,3-Dichlorobenzene | 17 Acenaphthene | 33 Benzidine |
| 2 1,4-Dichlorobenzene | 18 Dimethyl phthalate | 34 Butyl benzyl phthalate |
| 3 1,2-Dichlorobenzene | 19 2,6-Dinitrotoluene | 35 Bis (2-ethylhexyl) phthalate |
| 4 Hexachloroethane | 20 Fluorene | 36 Chrysene |
| 5 Bis (2-chloroethyl) ether | 21 4-Chlorophenyl phenyl ether | 37 Benzo(a)anthracene |
| 6 Bis (2-chloroisopropyl) ether | 22 2,4-Dinitrotoluene | 38 3,3-Dichlorobenzidine |
| 7 N-Nitrosodi-n-propylamine | 23 1,2-Diphenylhydrazine | 39 Di-n-octylphthalate |
| 8 Nitrobenzene | 24 Diethylphthalate | 40 Benzo(b)fluoranthene |
| 9 Hexachlorobutadiene | 25 N-nitrosodiphenylamine | 41 Benzo(k)fluoranthene |
| 10 1,2,4-Trichlorobenzene | 26 Hexachlorobenzene | 42 Benzo(a)pyrene |
| 11 Isophorone | 27 4-Bromophenyl phenyl ether | 43 Indeno(1,2,3-cd)pyrene |
| 12 Naphthalene | 28 Phenanthrene | 44 Dibenzo(a,h)anthracene |
| 13 Bis (2-chloroethoxy) methane | 29 Anthracene | 45 Benzo(g,h,i)perylene |
| 14 Hexachlorocyclopentadiene | 30 Di-n-butyl phthalate | 46 N-Nitrosodimethyl Amine |
| 15 2-Chloronaphthalene | 31 Fluoranthene | |
| 16 Acenaphthalene | 32 Pyrene | |

PESTICIDES/PCB PRIORITY POLLUTANTS

| | | |
|-----------------------|-----------------------|------------------|
| 1 Alpha-BHC | 10 Dieldrin | 19 Toxaphene |
| 2 Gamma-BHC (Lindane) | 11 Endrin | 20 Arochlor-1016 |
| 3 Beta-BHC | 12 4,4'-DDD | 21 Arochlor-1242 |
| 4 Delta-BHC | 13 Endosulfan II | 22 Arochlor-1221 |
| 5 Heptachlor | 14 4,4'-DDT | 23 Arochlor-1232 |
| 6 Aldrin | 15 Endosulfan Sulfate | 24 Arochlor-1248 |
| 7 Heptachlor epoxide | 16 Endrin Aldehyde | 25 Arochlor-1254 |
| 8 Endosulfan I | 17 Methoxychlor | 26 Arochlor-1260 |
| 9 4,4'-DDE | 18 Chlordane | 27 Endrin ketone |

PCDDs/PCDFs

| | | |
|-------------|-------------|-------------|
| 1 Tetra-CDD | 5 Octa-CDD | 9 Hepta-CDF |
| 2 Penta-CDD | 6 Tetra-CDF | 10 Octa-CDF |
| 3 Hexa-CDD | 7 Penta-CDF | |
| 4 Hepta-CDD | 8 Hexa-CDF | |

LIST OF CHEMICAL COMPOUNDS FOR ANALYSIS

EXPLOSIVES RESIDUES BY HPLC

1 HMX
2 RDX
3 1,3,5 TNB

4 1,3 DNB
5 NB
6 TETRYL

7 2,4,6 TNT
8 2,6 DNT
9 2,4 DNT

METALS (ICPs AND PP ATOMIC ABS.)

1 Aluminum
2 Antimony
3 Arsenic
4 Barium
5 Cadmium
6 Calcium
7 Chromium
8 Cobalt
9 Copper

10 Iron
11 Lead
12 Magnesium
13 Manganese
14 Molybdenum
15 Mercury
16 Nickel
17 Potassium
18 Selenium

20 Silver
21 Sodium
22 Tin
23 Titanium
24 Vanadium
25 Zinc

OTHERS

INDIATORS

1 pH
2 Specific Conductivity
3 Total Organic Carbon
4 Total Organic Halides

NITROGEN SERIES

1 Ammonia Nitrogen
2 Nitrate Nitrogen
3 Nitrite Nitrogen
4 Total Kjeldahl Nitrogen

CYANIDE

CATION EXCHANGE CAPACITY

TOTAL PHOSPHORUS

SAFE DRINKING WATER ACT STANDARDS

Primary Inorganic Chemicals

1 Arsenic
2 Barium
3 Cadmium
4 Chromium
5 Fluoride
6 Lead
7 Mercury
8 Nitrate
9 Silver

Organic Chemicals

1 Endrin
2 Lindane
3 Methoxychlor
4 Toxaphene
5 2,4-D
6 2,4,5-TP Silvex

Secondary Inorganic Chemicals

1 Chloride
2 Copper
3 Iron
4 Manganese
5 Sodium
6 Sulfate
7 Zinc
8 Corrosivity

RI/FS SAMPLING & ANALYSIS SUMMARY

| SITE NO. | SAMPLING SITE | WATER NO. OF ANAL. SAMPL TYPE | WELL NO. OF ANAL. SAMPL TYPE | SOILS NO. OF ANAL. SAMPL TYPE | SEDIMENTS NO. OF ANAL. SAMPL TYPE | BIOTA NO. OF ANAL. SAMPL TYPE |
|----------|---------------------------|-------------------------------------|------------------------------------|-------------------------------------|---|-------------------------------------|
| 3 | AREA 11 SOUTH LANDFILL | 0 - | 0 - | 3 A 1 F | 1 A 1 D | 0 - |
| 4 | AREA 11 NORTH LANDFILL | 0 - | 0 - | 1 D | 1 A 1 F | 0 - |
| 5 | AREA 11 ACID POND | 1 A | 0 - | 1 A | 1 A 1 F | 0 - |
| 7A D | AREA NORTH LAWN | 0 - | 0 - | 16 A 1 F | 0 - | 0 - |
| 11A P | AREA NORTH | 0 - | 0 - | 4 A | 4 A 1 F | 0 - |
| 7 D | AREA SOUTHEAST DRAINAGE | 1 A | 0 - | 0 - | 1 A | 0 - |
| 8 D | AREA SOUTHWEST DRAINAGE | 1 A | 0 - | 0 - | 1 A | 0 - |
| 9 D | AREA NORTHWEST DRAINAGE | 1 A | 0 - | 0 - | 1 A | 0 - |
| 10 | WATERWORKS NORTH DRAINAGE | 1 A | 0 - | 0 - | 1 D 1 G | 0 - |
| 11 P | AREA SOUTHEAST DRAINAGE | 1 A | 0 - | 0 - | 1 A 1 F | 0 - |
| 20 D | AREA SOUTH | 1 A | 0 - | 0 - | 1 A 1 F | 0 - |
| 12 | AREA 14 LANDFILL | 1 A | 0 - | 1 D | 1 A 1 G | 0 - |
| 13 | AREA 14 CHANGE HOUSE SITE | 0 - | 0 - | 6 A | 0 - | 0 - |
| 14 | AREA 14 SOLVENT STORAGE | 2 A | 0 - | 0 - | 2 A 1 F | 0 - |
| 15 | AREA 7 PLATING POND | 1 A | 1 I | 0 - | 1 A | 0 - |
| 16 | AREA 7 INDUSTRIAL SITE | 4 A | 0 - | 7 A 2 D 1 F 1 G | 4 A 1 F | 0 - |
| 17 | JOB CORPS LANDFILL | 2 A | 4 I | 5 A 2 D 2 G | 0 - | 0 - |
| 18 | AREA 13 LOADING PLATFORM | 0 - | 0 - | 4 A 1 F | 0 - | 0 - |
| 19 | AREA 13 BUNKER 1-3 | 0 - | 0 - | 5 A | 0 - | 0 - |

RI/FS SAMPLING & ANALYSIS SUMMARY

| SITE NO. | SAMPLING SITE | WATER NO. OF ANAL. SAMPL TYPE | WELL NO. OF ANAL. SAMPL TYPE | SOILS NO. OF ANAL. SAMPL TYPE | SEDIMENTS NO. OF ANAL. SAMPL TYPE | BIOTA NO. OF ANAL. SAMPL TYPE |
|--------------------------|----------------------------|-------------------------------------|------------------------------------|-------------------------------------|---|-------------------------------------|
| | | | | 1 F | | |
| 30 | MUNITIONS CONTROL SITE | 0 - | 1 I | 1 D 1 G | 0 - | 0 - |
| 21 | SOUTHEAST CORNER FIELD | 0 - | 0 - | 4 A 1 F | 0 - | 0 - |
| 22 | OLD REFUGE SHOP | 1 A | 0 - | 0 - | 1 A 1 F | 0 - |
| 24 | PEPSI-WEST | 1 A 1 F | 0 - | 0 - | 1 A 1 F | 0 - |
| 25 | C.O.CREEK AT MARION LF | 3 A | 0 - | 0 - | 2 A 1 D 1 G | 0 - |
| 26 | C.O.CREEK BELOW MARION STP | 2 A | 0 - | 0 - | 2 A 1 G | 0 - |
| 27 | C.O.CREEK BELOW 157 DREDGE | 1 A | 0 - | 0 - | 1 D | 0 - |
| 28 | WATER TOWER LANDFILL | 0 - | 2 I | 11 A 1 D 1 G | 0 - | 0 - |
| 29 | FIRE STATION LANDFILL | 0 - | 4 I | 5 A 2 D 1 G | 0 - | 0 - |
| 32 | AREA 9 LANDFILL | 0 - | 3 I | 1 A 8 B 27 C 9 H | 15 A 3 D | 0 - |
| 33 | AREA 9 BUILDING COMPLEX | 0 - | 0 - | 164 B 4 D | 0 - | 0 - |
| 35 | AREA 9 EAST WATERWAY | 0 - | 0 - | 0 - | 1 A 1 F | 0 - |
| 34 | CRAB ORCHARD LAKE | 10 I 5 E | 0 - | 0 - | 8 I 2 H | 34 I 2 H |
| 31 | REFUGE CONTROL SITE | 0 - | 1 I | 1 D 1 G | 0 - | 0 - |
| TOTAL NUMBER OF ANALYSES | | 41 | 16 | 328 | 73 | 36 |

RI/FS SAMPLING & ANALYSIS SUMMARY

PHASE I SAMPLING AND ANALYSIS SUMMARY ANALYSIS SET

| NO. OF ANALYSES | SCREENING | | | | TOTAL NO | | FULL ANALYSIS | | | TOTAL | |
|------------------|-----------|-----|----|----|----------|----------|---------------|----|----|-------|----------|
| | A | B | C | D | E | OF SAMPL | F | G | H | I | ANALYSIS |
| WATER | 25 | 0 | 0 | 0 | 5 | 30 | 1 | 0 | 0 | 10 | 41 |
| WELL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 16 |
| SOILS | 72 | 192 | 27 | 15 | 0 | 306 | 6 | 7 | 9 | 0 | 328 |
| SEDIMENTS | 42 | 0 | 0 | 7 | 0 | 49 | 10 | 4 | 2 | 8 | 73 |
| BIOTA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 34 | 36 |
| SUB-TOTAL | 139 | 192 | 27 | 22 | 5 | 385 | 17 | 11 | 13 | 68 | 494 |
| QA/QC - WATER | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 7 |
| QA/QC - SOIL | 12 | 31 | 4 | 6 | 0 | 53 | 1 | 2 | 2 | 0 | 58 |
| QA/QC - SEDIMENT | 7 | 0 | 0 | 1 | 0 | 8 | 2 | 1 | 1 | 3 | 15 |
| QA/QC - BLANKS | 9 | 0 | 0 | 1 | 0 | 10 | 0 | 2 | 1 | 1 | 14 |
| QA/QC - TOTAL | 29 | 31 | 4 | 8 | 0 | 72 | 3 | 5 | 4 | 10 | 94 |
| TOTAL | 168 | 223 | 31 | 30 | 5 | 457 | 20 | 16 | 17 | 78 | 588 |

NOTE: Groundwater well and biota samples to be analyzed in PHASE II

PHASE II SAMPLING AND ANALYSIS CONTINGENCY ANALYSIS PARAMETERS

| NO. OF SAMPLES | EXPLOSIV | METALS | PCDDs/PRIOR. POL. | | | | MISC. | TOTAL |
|----------------|----------|--------|-------------------|-------|----------|--|-------|-------|
| | | | PCBs | PCDFs | ORGANICS | | | |
| WATER | 3 | 3 | 0 | 0 | 3 | | 10 | 19 |
| WELL | 3 | 3 | 0 | 3 | 3 | | 10 | 22 |
| SOILS | 30 | 30 | 40 | 5 | 10 | | 30 | 145 |
| SEDIMENTS | 8 | 15 | 15 | 3 | 10 | | 20 | 71 |
| BIOTA | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| TOTAL NO. | 44 | 51 | 55 | 11 | 26 | | 70 | 257 |
| QA/QC Samples | 7 | 8 | 8 | 3 | 5 | | 12 | 43 |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL! | ! DEPTH! | ! LOCA! | ! INTRVL! | ! SAMP! | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|-----------|--------------------------|-----------------|----------------|-------------|----------|---------|-----------|---------|-----|-----------|------------|--------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| *** | #1 | 3:AREA 11 SOUTH LANDFILL | | | | | | | | | | | | |
| 3- | 1 | SOIL | NORTH BANK | COMP. 6 GRABS | 0-1 FT | A | I | P | Y | 1 | 9401 | FWS | *** 8/14/85 | |
| 3- | 2 | SOIL | SOUTH BANK | COMP. 6 GRABS | 0-1 FT | A | I | P | Y | 2 | 9402 | DUPL | *** 8/14/85 | 19221 |
| 3- | 2 | SOIL | SOUTH BANK | COMP. 6 GRABS | 0-1 FT | F | I | P | Y | 572 | 9257 | DUPL | *** 11/19/85 | 19222 |
| 3- | 3 | SOIL | EAST MOUND | COMP. 4 GRABS | 0-1 FT | A | I | P | W | 3 | 9403 | SPKE | *** 8/14/85 | 19266 |
| 3- | 4 | SEDIMENT | MARSH | COMP. 10 GRABS | 0-1 FT | D | K | R,S | Y | 4 | 9404 | | *** 8/14/85 | |
| 3- | 5 | SEDIMENT | LOWER STREAM | COMP. 10 GRABS | 0-1 FT | A | K | P,R,S | Y | 5 | 9405 | | *** 8/14/85 | |
| *** | | 4:AREA 11 NORTH LANDFILL | | | | | | | | | | | | |
| 4- | 1 | SOIL | BARE PATCHES | COMP. 6 GRABS | 0-1 FT | D | I | P,U | Y | 6 | 9406 | | *** 8/13/85 | |
| 4- | 2 | SEDIMENT | SWAMPY SED. | COMP. 6 GRABS | 0-1 FT | A | K | R | X | 7 | 9407 | | *** 8/13/85 | |
| 4- | 2 | SEDIMENT | SWAMPY SED. | COMP. 6 GRABS | 0-1 FT | F | K | R | X | 573 | 9258 | FWS | *** 11/19/85 | |
| *** | | 5:AREA 11 ACID POND | | | | | | | | | | | | |
| 5- | 1 | WATER | POND WATER | COMP. 4 GRABS | SURFACE | A | N | R | Y | 8 | 9408 | | *** 8/13/85 | |
| 5- | 2 | SOIL | DEAD TREE AREA | COMP. 4 GRABS | 0-1 FT | A | K | P,R,U | Y | 9 | 9409 | FWS | *** 8/13/85 | |
| 5- | 3 | SEDIMENT | POND SED. | COMP. 4 GRABS | 0-1 FT | A | K | R | Y | 10 | 9410 | | *** 8/13/85 | |
| 5- | 3 | SEDIMENT | POND SED. | COMP. 4 GRABS | 0-1 FT | F | K | R | Y | 574 | 9259 | | *** 11/19/85 | |
| *** | #2 | 7A:D AREA NORTH LAWN | | | | | | | | | | | | |
| 7A- | 1 | SOIL | LOW SPOTS-SURF | COMP. 8 GRABS | SURFACE | A+OVA | I | U | X | 11 | 9411 | | *** 8/17/85 | |
| 7A- | 2 | SOIL | LOW SPOTS-1 FT | COMP. 8 GRABS | 6-12 INCHES | A+OVA | M | U | X | 12 | 9412 | | *** 8/17/85 | |
| 7A- | 3 | SOIL | LOW SPOTS-2 FT | COMP. 8 GRABS | 1-2 FEET | A+OVA | M | U | X | 13 | 9413 | FWS | *** 8/17/85 | |
| 7A- | 4 | SOIL | LOW SPOTS-3 FT | COMP. 8 GRABS | 2-3 FEET | A+OVA | M | U | X | 14 | 9414 | | *** 8/17/85 | |
| 7A- | 5 | SOIL | TRANSECT A-SURF | COMP. 3 GRABS | SURFACE | A+OVA | J | Q | X | 15 | 9415 | | *** 8/17/85 | |
| 7A- | 6 | SOIL | TRANSECT A-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA | M | Q | X | 16 | 9416 | | *** 8/17/85 | |
| 7A- | 7 | SOIL | TRANSECT A-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA | M | Q | X | 17 | 9417 | DUPL | *** 8/17/85 | 19226 |
| 7A- | 8 | SOIL | TRANSECT A-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA | M | Q | X | 18 | 9418 | | *** 8/17/85 | |
| 7A- | 9 | SOIL | TRANSECT B-SURF | COMP. 3 GRABS | SURFACE | A+OVA | J | Q | X | 19 | 9419 | | *** 8/17/85 | |
| 7A- | 9 | SOIL | TRANSECT B-SURF | COMP. 3 GRABS | SURFACE | F | M | Q | X | 575 | 9260 | | *** 11/19/85 | |
| 7A- | 10 | SOIL | TRANSECT B-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA | M | Q | X | 20 | 9420 | | *** 8/17/85 | |
| 7A- | 11 | SOIL | TRANSECT B-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA | M | Q | X | 21 | 9421 | | *** 8/17/85 | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL. DEPTH | LOC. SET | INTRVL. & NO. | SAMP. NOS. | LAB NO. | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|----------------------------------|----------|-----------------|---------------|-------------|-------------|----------|---------------|------------|---------|-------------------|-------------------|---------------------|-------|
| 7A- 12 | SOIL | TRANSECT B-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA M | Q | X | 22 | 9422 | | *** 8/17/85 | | |
| 7A- 13 | SOIL | TRANSECT C-SURF | COMP. 3 GRABS | SURFACE | A+OVA J | Q | X | 23 | 9423 | | *** 8/17/85 | | |
| 7A- 14 | SOIL | TRANSECT C-1FT | COMP. 3 GRABS | 6-12 INCHES | A+OVA M | Q | X | 24 | 9424 | | *** 8/17/85 | | |
| 7A- 15 | SOIL | TRANSECT C-2FT | COMP. 3 GRABS | 1-2 FEET | A+OVA M | Q | X | 25 | 9425 | | *** 8/17/85 | | |
| 7A- 16 | SOIL | TRANSECT C-3FT | COMP. 3 GRABS | 2-3 FEET | A+OVA M | Q | X | 26 | 9426 | | *** 8/17/85 | | |
| *** 11A:P AREA NORTH | | | | | | | | | | | | | |
| 11A- 1 | SEDIMENT | WEST SWALE | COMP. 3 GRABS | 0-1 FT | A J,K | Q,R | X | 27 | 9427 | SPKE | *** 8/16/85 | 19282 | |
| 11A- 2 | SEDIMENT | EAST SWALE | COMP. 7 GRABS | 0-1 FT | A J,K | Q,R | X | 28 | 9428 | FWS | *** 8/16/85 | | |
| 11A- 3 | SEDIMENT | NORTH SWALE 1 | COMP. 6 GRABS | 0-1 FT | A J,K | Q,R | X | 29 | 9429 | DUPL | *** 8/16/85 | 19254 | |
| 11A- 3 | SEDIMENT | NORTH SWALE 1 | COMP. 6 GRABS | 0-1 FT | F J,K | Q,R | X | 576 | 9261 | DUPL | *** 11/18/85 | 19225 | |
| 11A- 4 | SEDIMENT | NORTH SWALE 2 | COMP. 3 GRABS | 0-1 FT | A J,K | Q,R | X | 30 | 9430 | | *** 8/16/85 | | |
| 11A- 5 | SOIL | LOADING DOCK | COMP. 3 GRABS | 0-1 FT | A J | Q | W | 31 | 9431 | | *** 8/16/85 | | |
| 11A- 6 | SOIL | NORTH DOOR | COMP. 2 GRABS | 0-1 FT | A J | Q | W | 32 | 9432 | | *** 8/16/85 | | |
| 11A- 7 | SOIL | EAST LOAD AREA | COMP. 3 GRABS | 0-1 FT | A J | Q | W | 33 | 9433 | | *** 8/16/85 | | |
| 11A- 8 | SOIL | STEAMHOUSE DOOR | COMP. 2 GRABS | 0-1 FT | A J | Q | W | 34 | 9434 | | *** 8/16/85 | | |
| *** 7:D AREA SOUTHEAST DRAINAGE | | | | | | | | | | | | | |
| 7- 1 | WATER | D-SE WATER | COMP. 4 GRABS | SURFACE | A N | R | W | 35 | 19209 | | *** 8/16/85 | | |
| 7- 2 | SEDIMENT | D-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | A K | R | W | 36 | 19210 | DUPL | *** 8/16/85 | 19255 | |
| *** 8:D AREA SOUTHWEST DRAINAGE | | | | | | | | | | | | | |
| 8- 1 | WATER | D-SW WATER | COMP. 2 GRABS | SURFACE | A N | R | W | 37 | 3258 | | *** 7/25/85 | | |
| 8- 2 | SEDIMENT | D-SW SEDIMENT | COMP. 4 GRABS | 0-1 FT | A K | R | W | 38 | 3386 | | *** 7/25/85 | | |
| *** 9:D AREA NORTHWEST DRAINAGE | | | | | | | | | | | | | |
| 9- 1 | WATER | P-NW WATER | COMP. 4 GRABS | SURFACE | A N | R | W | 39 | 3257 | | *** 7/25/85 | | |
| 9- 2 | SEDIMENT | P-NW SEDIMENT | COMP. 4 GRABS | 0-1 FT | A K | R | W | 40 | 3385 | | *** 7/25/85 | | |
| *** 10:WATERWORKS NORTH DRAINAGE | | | | | | | | | | | | | |
| 10- 1 | WATER | WW-N WATER | COMP. 4 GRABS | SURFACE | A N | R,S | W | 41 | 3250 | | *** 7/25/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCATION | INTERVAL | SAMPLE NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|------|------------|------------------------------|----------------|---------|----------|-------|----------|----------|-------------|--------|-------------------|-------------------|---------------------|----------------|
| 10- | 2 SEDIMENT | WW-N SEDIMENT | COMP. 4 GRABS | 0-1 FT | D | K | R, S | W | 42 | 42 | FWS | *** 7/25/85 | | |
| 10- | 2 SEDIMENT | WW-N SEDIMENT | COMP. 4 GRABS | 0-1 FT | G | K | R, S | W | 577 | 9262 | DUPL | *** 11/19/85 | 19259 | |
| *** | | 11:P AREA SOUTHEAST DRAINAGE | | | | | | | | | | | | |
| 11- | 1 WATER | P-SE WATER | COMP. 4 GRABS | SURFACE | A | N | R | W | 43 | 3247 | | *** 7/25/85 | | |
| 11- | 2 SEDIMENT | P-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | A | K | R | W | 44 | 44 | | *** 7/25/85 | | |
| 11- | 2 SEDIMENT | P-SE SEDIMENT | COMP. 4 GRABS | 0-1 FT | F | K | R | W | 578 | 9263 | | *** 11/18/85 | | |
| *** | | 20:D AREA SOUTH | | | | | | | | | | | | |
| 20- | 1 WATER | D SOUTH | COMP. 4 GRABS | SURFACE | A | N | R | X | 45 | 9383 | | --- 7/25/85 | | NO WATER |
| 20- | 2 SEDIMENT | D SOUTH | COMP. 4 GRABS | 0-1 FT | A | K | R | X | 46 | 3389 | | *** 7/25/85 | | |
| 20- | 2 SEDIMENT | D SOUTH | COMP. 4 GRABS | 0-1 FT | F | K | R | X | 579 | 9264 | | *** 11/18/85 | | |
| *** | #3 | 12:AREA 14 LANDFILL | | | | | | | | | | | | |
| 12- | 1 WATER | DRAINAGE CHANNEL | COMP. 4 GRABS | SURFACE | A | N | P, R | W | 47 | 9384 | | --- 7/25/85 | | NO WATER |
| 12- | 2 SEDIMENT | DRAINAGE CHANNEL | COMP. 4 GRABS | 0-1 FT | A | I, K | P, R | W | 48 | 3387 | DUPL | *** 7/25/85 | 9255 | |
| 12- | 2 SEDIMENT | DRAINAGE CHANNEL | COMP. 4 GRABS | 0-1 FT | G | I, K | P, R | W | 580 | 9265 | | *** 11/18/85 | | |
| 12- | 3 SOIL | BLACK RESIDUE | COMP. 4 GRABS | 0-1 FT | D | I | P, U | W | 49 | 9385 | FWS | *** 8/14/85 | | |
| *** | | 13:AREA 14 CHANGE HOUSE SITE | | | | | | | | | | | | |
| 13- | 1 SOIL | TRANSECT 1 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 50 | 9386 | | *** 8/15/85 | | CLOSEST TO RD. |
| 13- | 2 SOIL | TRANSECT 2 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 51 | 9387 | FWS | *** 8/15/85 | | |
| 13- | 3 SOIL | TRANSECT 3 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 52 | 9388 | | *** 8/15/85 | | |
| 13- | 4 SOIL | TRANSECT 4 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 53 | 9389 | | *** 8/15/85 | | |
| 13- | 5 SOIL | TRANSECT 5 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 54 | 9390 | | *** 8/15/85 | | |
| 13- | 6 SOIL | TRANSECT 6 | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 55 | 9391 | | *** 8/15/85 | | |
| *** | | 14:AREA 14 SOLVENT STORAGE | | | | | | | | | | | | |
| 14- | 1 WATER | DITCH NORTH | COMP. 6 GRABS | SURFACE | A | N | Q, R | Y | 56 | 19301 | | *** 7/25/85 | | |
| 14- | 2 SEDIMENT | DITCH NORTH | COMP. 6 GRABS | 0-1 FT | A | K | Q, R | Y | 57 | 19302 | FWS | *** 7/25/85 | | |
| 14- | 3 WATER | DITCH SOUTH | COMP. 6 GRABS | SURFACE | A | N | Q, R | Y | 58 | 19303 | | *** 7/25/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCA-TION | INTRVL & NO. | SAMP NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|------|------------|----------------------------|----------------|---------|----------|-------|-----------|--------------|-----------|--------|-------------------|-------------------|---------------------|----------------|
| 14- | 4 SEDIMENT | DITCH SOUTH | COMP. 6 GRABS | 0-1 FT | A | K | Q, R | Y | 59 | 19304 | | *** 7/25/85 | | |
| 14- | 4 SEDIMENT | DITCH SOUTH | COMP. 6 GRABS | 0-1 FT | F | K | Q, R | Y | 581 | 9266 | | *** 11/18/85 | | |
| *** | #4 | 15: AREA 7 PLATING POND | | | | | | | | | | | | |
| 15- | 1 WATER | PLATING POND | COMP. 4 GRABS | SURFACE | A | N | Q | Y | 60 | 19305 | | *** 7/25/85 | | |
| 15- | 2 SEDIMENT | PLATING POND | COMP. 4 GRABS | 0-1 FT | A | K | Q | Y | 61 | 19306 | | *** 7/25/85 | | NO FWS REP. |
| 15- | 3 WATER | MONITOR WELL | SINGLE SAMPLE | BAILER | I | - | Q | - | 62 | 9393 | | . | | Depth 11/19/85 |
| *** | | 16: AREA 7 INDUSTRIAL SITE | | | | | | | | | | | | |
| 16- | 1 WATER | DITCH NO.1 | COMP. 2 GRABS | SURFACE | A | N | R, S | W | 63 | 19307 | | *** 7/25/85 | | |
| 16- | 2 SEDIMENT | DITCH NO.1 | COMP. 2 GRABS | 0-1 FT | A | K | R, S | W | 64 | 19308 | | *** 7/25/85 | | |
| 16- | 3 WATER | DITCH NO.2 | COMP. 2 GRABS | SURFACE | A | N | R | W | 65 | 19309 | | *** 7/25/85 | | |
| 16- | 4 SEDIMENT | DITCH NO.2 | COMP. 2 GRABS | 0-1 FT | A | K | R | W | 66 | 19310 | FWS | *** 7/25/85 | | |
| 16- | 4 SEDIMENT | DITCH NO.2 | COMP. 2 GRABS | 0-1 FT | F | K | R | W | 582 | 9267 | | *** 11/19/85 | | |
| 16- | 5 WATER | DITCH NO.3 | COMP. 2 GRABS | SURFACE | A | N | R | W | 67 | 9394 | | --- 7/25/85 | | |
| 16- | 6 SEDIMENT | DITCH NO.3 | COMP. 2 GRABS | 0-1 FT | A | K | R | W | 68 | 9395 | | --- 7/25/85 | | |
| 16- | 7 WATER | DITCH NO.4 | COMP. 2 GRABS | SURFACE | A | N | R | W | 69 | 9396 | | --- 7/25/85 | | NO WATER |
| 16- | 8 SEDIMENT | DITCH NO.4 | COMP. 2 GRABS | 0-1 FT | A | K | R | W | 70 | 9397 | | *** 7/25/85 | | |
| 16- | 9 SOIL | BLDG 3-4 FRONT | COMP. 12 GRABS | SURFACE | D | I | P | Y | 71 | 9398 | DUPL | *** 8/17/85 | 19253 | |
| 16- | 10 SOIL | BLDG 3-4 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 72 | 9399 | | *** 8/17/85 | | |
| 16- | 10 SOIL | BLDG 3-4 BACK | COMP. 6 GRABS | 0-1 FT | G | J | Q | X | 583 | 9268 | FWS | *** 11/19/85 | | |
| 16- | 11 SOIL | BLDG 3-5 FRONT | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 73 | 9400 | | *** 8/17/85 | | |
| 16- | 12 SOIL | BLDG 3-5 BACK | COMP. 12 GRABS | SURFACE | A | I | P | Y | 74 | 9435 | | *** 8/17/85 | | |
| 16- | 13 SOIL | BLDG 4-4 FRONT | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 75 | 9436 | SPKE | *** 8/17/85 | 19267 | |
| 16- | 14 SOIL | BLDG 4-4 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 76 | 9437 | | *** 8/17/85 | | |
| 16- | 15 SOIL | BLDG 5-2&3 FRONT | COMP. 12 GRABS | SURFACE | D | I | P | Y | 77 | 9438 | FWS | *** 8/17/85 | | |
| 16- | 15 SOIL | BLDG 5-2&3 FRONT | COMP. 12 GRABS | SURFACE | F | I | P | Y | 584 | 9269 | | *** 11/19/85 | | |
| 16- | 16 SOIL | BLDG 5-2&3 BACK | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 78 | 9439 | | *** 8/17/85 | | |
| 16- | 17 SOIL | BLDG 6-1 CONTRL | COMP. 6 GRABS | 0-1 FT | A | J | Q | X | 79 | 9440 | | *** 8/17/85 | | |
| *** | #5 | 17: JOB CORPS LANDFILL | | | | | | | | | | | | |
| 17- | 1 SOIL | SOIL GRID 1 | COMP. 5 GRABS | 0-1 FT | A | I | P | X | 80 | 9441 | | *** 8/16/85 | | |
| 17- | 2 SOIL | SOIL GRID 2 | COMP. 5 GRABS | 0-1 FT | A | I | P | X | 81 | 9442 | | *** 8/16/85 | | |

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|--------|--------|-----------------------------|----------------|---------|----------|-------|-----------|--------------|-----------|--------|-------------------|-------------------|---------------------|-------|
| 17- 2 | SOIL | SOIL GRID 2 | COMP. 5 GRABS | 0-1 FT | G | I | P | X | 565 | 9270 | DUPL | *** 11/18/85 | 19227 | |
| 17- 3 | SOIL | SOIL GRID 3 | COMP. 5 GRABS | 0-1 FT | D | I | P | X | 82 | 9443 | DUPL | *** 8/16/85 | 19290 | |
| 17- 4 | SOIL | SOIL GRID 4 | COMP. 5 GRABS | 0-1 FT | A | I | P | X | 83 | 9444 | | *** 8/16/85 | | |
| 17- 5 | SOIL | SOIL GRID 5 | COMP. 5 GRABS | 0-1 FT | A | I | P | X | 84 | 9445 | | *** 8/16/85 | | |
| 17- 6 | SOIL | BARE PATCH 1 | COMP. 2 GRABS | 0-1 FT | D | I | P,U | W | 85 | 9446 | | *** 8/16/85 | | |
| 17- 6 | SOIL | BARE PATCH 1 | COMP. 2 GRABS | 0-1 FT | G | I | P,U | W | 586 | 9271 | | *** 11/18/85 | | |
| 17- 7 | SOIL | BARE PATCH 2 | COMP. 2 GRABS | SURFACE | A | I | P,U | W | 86 | 9447 | FWS | *** 8/16/85 | | |
| 17- 8 | WATER | WELL 17-1 | SINGLE SAMPLE | BAILER | I | - | - | - | 87 | 9448 | | . | | |
| 17- 9 | WATER | WELL 17-2 | SINGLE SAMPLE | BAILER | I | - | - | - | 88 | 9449 | | . | | |
| 17- 10 | WATER | WELL 17-3 | SINGLE SAMPLE | BAILER | I | - | - | - | 89 | 9450 | | . | | |
| 17- 11 | WATER | WELL 17-4 | SINGLE SAMPLE | BAILER | I | - | - | - | 90 | 9451 | | . | | |
| 17- 12 | WATER | POND NO.1 | SINGLE SAMPLE | SURFACE | A | K,N | R | W | 91 | 3248 | | *** 7/25/85 | | |
| 17- 13 | WATER | POND NO.2 | SINGLE SAMPLE | SURFACE | A | K,N | R | W | 92 | 3249 | | *** 7/25/85 | | |
| *** | #6 | 18:AREA 13 LOADING PLATFORM | | | | | | | | | | | | |
| 18- 1 | SOIL | LOADING DOCK N | COMP. 20 GRABS | 0-1 FT | A | J | Q | Y | 93 | 9452 | FWS | *** 8/15/85 | | |
| 18- 2 | SOIL | LOADING DOCK S | COMP. 20 GRABS | 0-1 FT | A | J | Q | Y | 94 | 9453 | DUPL | *** 8/15/85 | 19223 | |
| 18- 3 | SOIL | LOADING DOCK E | COMP. 2 GRABS | 0-1 FT | A | J | Q | W | 95 | 9454 | | *** 8/15/85 | | |
| 18- 4 | SOIL | LOADING DOCK W | COMP. 2 GRABS | 0-1 FT | A | I | P,Q | W | 96 | 9455 | | *** 8/15/85 | | |
| 18- 4 | SOIL | LOADING DOCK W | COMP. 2 GRABS | 0-1 FT | F | I | P,Q | W | 587 | 9272 | | *** 11/19/85 | | |
| *** | | 19:AREA 13 BUNKER 1-3 | | | | | | | | | | | | |
| 19- 1 | SOIL | SOIL GRID NE | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y | 97 | 9456 | | *** 8/16/85 | | |
| 19- 2 | SOIL | SOIL GRID SE | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y | 98 | 9457 | | *** 8/16/85 | | |
| 19- 3 | SOIL | SOIL GRID NW | COMP. 14 GRABS | 0-1 FT | A | J | Q | Y | 99 | 9458 | | *** 8/16/85 | | |
| 19- 3 | SOIL | SOIL GRID NW | COMP. 14 GRABS | 0-1 FT | F | J | Q | Y | 588 | 9273 | | *** 11/19/85 | | |
| 19- 4 | SOIL | SOIL GRID FRONT | COMP. 10 GRABS | 0-1 FT | A | J | Q | Y | 100 | 9459 | SPKE | *** 8/16/85 | 19268 | |
| 19- 5 | SOIL | BR. PATCH TRANSECT | COMP. 3 GRABS | 0-1 FT | A | J | Q,U | X | 101 | 9460 | FWS | *** 8/16/85 | | |
| *** | | 30:MUNITIONS CONTROL SITE | | | | | | | | | | | | |
| 30- 1 | SOIL | MUNITION CONTROL | SINGLE SAMPLE | SURFACE | D | - | T | W | 102 | 9461 | DUPL FWS | *** 8/16/85 | 19289 BUNKER 1-11 | |
| 30- 1 | SOIL | MUNITION CONTROL | SINGLE SAMPLE | SURFACE | G | - | T | W | 589 | 9274 | FWS | *** 11/19/85 | | |
| 30- 2 | WATER | MUNITION CONTROL | SINGLE SAMPLE | BAILER | I | - | T | W | 103 | 9462 | | . | | |

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|------|--------|--------------------------------|------------------|---------------|-------------|-------|---------------|-----------------|--------------|-----------|----------------------|----------------------|------------------------|-----------------|
| *** | #7 | 21:SOUTHEAST CORNER FIELD | | | | | | | | | | | | |
| 21- | 1 | SOIL | TRANSECT 1 | COMP. 6 GRABS | 0-1 FT | A | J | Q | Y | 104 | 9463 DUSP | *** 8/14/85 | 19224 | 1st, SPKE 14138 |
| 21- | 1 | SOIL | TRANSECT 1 | COMP. 6 GRABS | 0-1 FT | F | J | Q | Y | 590 | 9275 | *** 11/19/85 | | |
| 21- | 2 | SOIL | TRANSECT 2 | COMP. 6 GRABS | 0-1 FT | A | J | Q | Y | 105 | 9464 | *** 8/14/85 | | 4th FROM RD. |
| 21- | 3 | SOIL | TRANSECT 3 | COMP. 6 GRABS | 0-1 FT | A | J | Q | Y | 106 | 9465 | *** 8/14/85 | | 6th FROM RD. |
| 21- | 4 | SOIL | TRANSECT 4 | COMP. 6 GRABS | 0-1 FT | A | J | Q | Y | 107 | 9466 | *** 8/14/85 | | 8th FROM RD. |
| *** | #8 | 22:OLD REFUGE SHOP | | | | | | | | | | | | |
| 22- | 1 | WATER | POOL WATER | SINGLE GRAB | SURFACE | A | K,N | P | W | 108 | 3256 | *** 7/25/85 | | |
| 22- | 2 | SEDIMENT | STREAM SEDIMENTS | COMP. 2 GRABS | 0-1 FT | A | K | Q,R | W | 109 | 3384 FWS | *** 7/25/85 | | |
| 22- | 2 | SEDIMENT | STREAM SEDIMENTS | COMP. 2 GRABS | 0-1 FT | F | K | Q,R | W | 591 | 9276 | *** 12/05/85 | | |
| *** | | 24:PEPSI-WEST | | | | | | | | | | | | |
| 24- | 1 | WATER | PEPSI-WEST | COMP. 3 GRABS | SURFACE | A | K,N | R | W | 110 | 3254 | *** 7/25/85 | | |
| 24- | 1 | WATER | PEPSI-WEST | COMP. 3 GRABS | SURFACE | F | K,N | R | W | 592 | 9277 | --- 12/05/85 | | |
| 24- | 2 | SEDIMENT | PEPSI-WEST | COMP. 3 GRABS | 0-1 FT | A | K | R | W | 111 | 2711 | *** 7/25/85 | | |
| 24- | 2 | SEDIMENT | PEPSI-WEST | COMP. 3 GRABS | 0-1 FT | F | K | R | W | 593 | 9278 SPKE | *** 12/05/85 | 19262 | |
| *** | | 25:C.O. CREEK AT MARION LF | | | | | | | | | | | | |
| 25- | 1 | WATER | COC DOWNSTREAM | COMP. 3 GRABS | SURFACE | A | K,N | R | W | 112 | 3243 | *** 7/25/85 | | |
| 25- | 2 | SEDIMENT | COC DOWNSTREAM | COMP. 3 GRABS | 0-1 FT | D | K | R | W | 113 | 3368 | *** 7/25/85 | | |
| 25- | 3 | SEDIMENT | COC DOWNSTREAM | COMP. 3 GRABS | 0-1 FT | G | K | R | W | 594 | 9279 | *** 12/05/85 | | |
| 25- | 3 | WATER | COC UPSTREAM | COMP. 3 GRABS | SURFACE | A | - | T | W | 114 | 9467 DUSP | *** 8/13/85 | 19215 | SPKE 85576 |
| 25- | 4 | SEDIMENT | COC UPSTREAM | COMP. 3 GRABS | 0-1 FT | A | - | T | W | 115 | 9468 DUPL | *** 8/13/85 | 19256 | |
| 25- | 5 | WATER | LF POND | COMP. 3 GRABS | SURFACE | A | K,N | R | W | 116 | 9469 | *** 8/13/85 | | |
| 25- | 6 | SEDIMENT | LF POND | COMP. 3 GRABS | 0-1 FT | A | K | R | W | 117 | 9470 FWS | *** 8/13/85 | | |
| *** | | 26:C.O. CREEK BELOW MARION STP | | | | | | | | | | | | |
| 26- | 1 | WATER | COC AT S. CARBON | COMP. 3 GRABS | SURFACE | A | K,N | R | W | 118 | 3244 | *** 7/25/85 | | |
| 26- | 2 | SEDIMENT | COC AT S. CARBON | COMP. 3 GRABS | 0-1 FT | A | K | R | W | 119 | 3391 | *** 7/25/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCATIONS | INTRVL & NO. | SAMP NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|------|--------|--------------------------------|--------------------|----------------|----------|-------|-----------|--------------|-----------|--------|-------------------|-------------------|---------------------|--------------------|
| 26- | 3 | SEDIMENT | CDC AT S. CARBON | COMP. 3 GRABS | 0-1 FT | G K | R | W | 595 | 9280 | | --- 12/05/85 | | Clay- no sediment. |
| 26- | 3 | WATER | CDC AT COURT ST. | COMP. 3 GRABS | SURFACE | A K,N | R | W | 120 | 9471 | | *** 8/13/85 | | |
| 26- | 4 | SEDIMENT | CDC AT COURT ST. | COMP. 3 GRABS | 0-1 FT | A K | R | W | 121 | 9472 | FWS | *** 8/13/85 | | |
| *** | | 27:C.O. CREEK BELOW 157 DREDGE | | | | | | | | | | | | |
| 27- | 1 | WATER | CDC AT CHAMMNESS | COMP. 3 GRABS | SURFACE | A K,N | R,S | W | 122 | 3245 | | *** 7/25/85 | | |
| 27- | 2 | SEDIMENT | CDC AT CHAMMNESS | COMP. 3 GRABS | 0-1 FT | D K | R,S | W | 123 | 3390 | | *** 7/25/85 | | |
| *** | #9 | 28:WATER TOWER LANDFILL | | | | | | | | | | | | |
| 28- | 1 | SOIL | MAIN GULLY | COMP. 8 GRABS | 0-1 FT | D K | R,S | X | 124 | 9473 | DUPL | *** 8/14/85 | 19291 | |
| 28- | 2 | SOIL | TRANS. GULLY | COMP. 6 GRABS | 0-1 FT | A I,K | P,R | X | 125 | 9474 | | *** 8/14/85 | | |
| 28- | 2 | SOIL | TRANS. GULLY | COMP. 6 GRABS | 0-1 FT | G I,K | P,R | X | 596 | 9281 | SPKE | *** 11/19/85 | 19263 | |
| 28- | 3 | SOIL | SOIL GRID 1 | COMP. 6 GRABS | 0-1 FT | A J | Q | X | 126 | 9475 | FWS | *** 8/14/85 | | |
| 28- | 4 | SOIL | SOIL GRID 2 | COMP. 6 GRABS | 0-1 FT | A J | Q | X | 127 | 9476 | | *** 8/14/85 | | |
| 28- | 5 | SOIL | SOIL GRID 3 | COMP. 6 GRABS | 0-1 FT | A J | Q | X | 128 | 9477 | | *** 8/14/85 | | |
| 28- | 6 | SOIL | SOIL GRID 4 | COMP. 6 GRABS | 0-1 FT | A J | Q | X | 129 | 9478 | | *** 8/14/85 | | |
| 28- | 7 | WATER | WELL 28-1 | SINGLE GRAB | BAILER | I - | V | W | 130 | 9479 | | . | | |
| 28- | 8 | WATER | WELL 28-2 | SINGLE GRAB | BAILER | I - | V | W | 131 | 9480 | | . | | |
| 28- | 9 | SOIL | SOUTH END OF DITCH | GRAB | 0-1 FT | A I,K | P,R | W | 132 | 9481 | SPKE | *** 8/14/85 | 19269 | |
| 28- | 10 | SOIL | NORTH END OF DITCH | GRAB | 0-1 FT | A I,K | P,R | W | 133 | 9482 | | *** 8/14/85 | | |
| 28- | 11 | SOIL | NORTH OF 28-4 | GRAB | 0-1 FT | A I | P | W | 134 | 9483 | | *** 8/14/85 | | |
| 28- | 12 | SOIL | NORTHWEST OF 28-3 | GRAB | 0-1 FT | A I | P | W | 135 | 9484 | | *** 8/14/85 | | |
| 28- | 13 | SOIL | N. FIELD-OLD 28-9 | GRAB | 0-1 FT | A I | P | W | 136 | 9485 | | *** 8/14/85 | | |
| 28- | 14 | SOIL | GULLY | GRAB | 0-1 FT | A I,K | P,R | W | 137 | 9486 | | *** 8/14/85 | | |
| *** | #10 | 29:FIRE STATION LANDFILL | | | | | | | | | | | | |
| 29- | 1 | SOIL | EAST FACE 1 | COMP. 12 GRABS | 0&1 FT | A I | P | X | 138 | 9487 | SPKE | *** 8/13/85 | 19268 | |
| 29- | 2 | SOIL | EAST FACE 2 | COMP. 12 GRABS | 0&1 FT | A I | P | X | 139 | 9488 | | *** 8/13/85 | | |
| 29- | 2 | SOIL | EAST FACE 2 | COMP. 12 GRABS | 0&1 FT | G I | P | X | 597 | 9282 | | *** 11/19/85 | | |
| 29- | 3 | SOIL | EAST FACE 3 | COMP. 12 GRABS | 0&1 FT | D I | P | X | 140 | 9489 | | *** 8/13/85 | | |
| 29- | 4 | SOIL | EAST FACE 4 | COMP. 12 GRABS | 0&1 FT | A I | P | X | 141 | 9490 | | *** 8/13/85 | | |
| 29- | 5 | SOIL | NORTH FACE 1 | COMP. 12 GRABS | 0&1 FT | A I | P | X | 142 | 9491 | DUPL | *** 8/13/85 | 19287 | |
| 29- | 6 | SOIL | NORTH FACE 2 | COMP. 12 GRABS | 0&1 FT | D I | P | X | 143 | 9492 | | *** 8/13/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCATION | INTRVL | SAMP | LAB NOS. | REPLICATE | SAMPLE COLL. | DATE | DUPL./SPIKE NUMBERS | NOTES |
|--------|--------|--------------------|------------------|----------|----------|-------|----------|--------|-------|----------|-----------|--------------|-------|---------------------|-------|
| 29- 7 | SOIL | NORTH FACE 3 | COMP. 12 GRABS | 0&1 FT | A I | P | X | 144 | 9493 | FWS | *** | 8/13/85 | | | |
| 29- 8 | WATER | WELL 29-1 | SINGLE GRAB | BAILER | I - | T | W | 145 | 9494 | | . | | | | |
| 29- 9 | WATER | WELL 29-2 | SINGLE GRAB | BAILER | I - | V | W | 146 | 9495 | | . | | | | |
| 29- 10 | WATER | WELL 29-3 | SINGLE GRAB | BAILER | I - | V | W | 147 | 9496 | | . | | | | |
| 29- 11 | WATER | WELL 29-4 | SINGLE GRAB | BAILER | I - | V | W | 148 | 9497 | | . | | | | |
| *** | #11 | 32:AREA 9 LANDFILL | | | | | | | | | | | | | |
| 32- 1 | SOIL | SOIL GRID 1 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 149 | 9498 | | *** | 8/24/85 | | | |
| 32- 2 | SOIL | SOIL GRID 1-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 150 | 9499 | | *** | 8/24/85 | | | |
| 32- 3 | SOIL | SOIL GRID 1-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 151 | 9500 | DUPL | *** | 8/24/85 | 19250 | | |
| 32- 4 | SOIL | SOIL GRID 1-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 152 | 10640 | | *** | 8/24/85 | | | |
| 32- 5 | SOIL | SOIL GRID 2 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 153 | 10641 | | *** | 8/24/85 | | | |
| 32- 6 | SOIL | SOIL GRID 2-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 154 | 10642 | | *** | 8/24/85 | | | |
| 32- 7 | SOIL | SOIL GRID 2-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 155 | 10643 | | *** | 8/24/85 | | | |
| 32- 8 | SOIL | SOIL GRID 2-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 156 | 10644 | | *** | 8/24/85 | | | |
| 32- 9 | SOIL | SOIL GRID 3 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 157 | 10645 | | *** | 8/21/85 | | | |
| 32- 10 | SOIL | SOIL GRID 3-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 158 | 10646 | | *** | 8/21/85 | | | |
| 32- 11 | SOIL | SOIL GRID 3-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 159 | 10647 | | *** | 8/21/85 | | | |
| 32- 12 | SOIL | SOIL GRID 3-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 160 | 10648 | | *** | 8/21/85 | | | |
| 32- 13 | SOIL | SOIL GRID 4 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 161 | 10649 | | *** | 8/21/85 | | | |
| 32- 14 | SOIL | SOIL GRID 4-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 162 | 10650 | | *** | 8/21/85 | | | |
| 32- 15 | SOIL | SOIL GRID 4-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 163 | 10651 | | *** | 8/21/85 | | | |
| 32- 16 | SOIL | SOIL GRID 4-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 164 | 10652 | | *** | 8/21/85 | | | |
| 32- 17 | SOIL | SOIL GRID 5 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 165 | 10653 | | *** | 8/22/85 | | | |
| 32- 18 | SOIL | SOIL GRID 5-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 166 | 10654 | DUPL | *** | 8/22/85 | 19249 | | |
| 32- 19 | SOIL | SOIL GRID 5-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 167 | 10655 | | *** | 8/22/85 | | | |
| 32- 20 | SOIL | SOIL GRID 5-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 168 | 10656 | | *** | 8/22/85 | | | |
| 32- 21 | SOIL | SOIL GRID 6 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 169 | 10657 | | *** | 8/22/85 | | | |
| 32- 22 | SOIL | SOIL GRID 6-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 170 | 10658 | FWS | *** | 8/22/85 | | | |
| 32- 23 | SOIL | SOIL GRID 6-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 171 | 10659 | | *** | 8/22/85 | | | |
| 32- 24 | SOIL | SOIL GRID 6-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 172 | 10660 | DUPL | *** | 8/22/85 | 19251 | | |
| 32- 25 | SOIL | SOIL GRID 7 | COMP. @1' DEPTHS | 0-12 FT | H L,M | P | Z | 173 | 10661 | DUPL | *** | 8/22/85 | 19252 | | |
| 32- 26 | SOIL | SOIL GRID 7-0 | TOP CORE COMP. | 0-6 INCH | C I | P | Z | 174 | 10662 | | *** | 8/22/85 | | | |
| 32- 27 | SOIL | SOIL GRID 7-1 | MID CORE COMP. | 6-6.5 FT | C L,M | P | Z | 175 | 10663 | | *** | 8/22/85 | | | |
| 32- 28 | SOIL | SOIL GRID 7-2 | BOT CORE COMP. | 11.5-12' | C L,M | P | Z | 176 | 10664 | | *** | 8/22/85 | | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOC | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|----------|------------------|-----------------|----------|------|-------|--------|--------|------|-------|-----------|-------------|-------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 32- 29 | SOIL | SOIL GRID 8 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P | Z | 177 | 10665 | SPKE | *** 8/23/85 | 19281 | |
| 32- 30 | SOIL | SOIL GRID 8-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z | 178 | 10666 | SPKE | *** 8/23/85 | 19280 | |
| 32- 31 | SOIL | SOIL GRID 8-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z | 179 | 10667 | FWS | *** 8/23/85 | | |
| 32- 32 | SOIL | SOIL GRID 8-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z | 180 | 10668 | | *** 8/23/85 | | |
| 32- 33 | SOIL | SOIL GRID 9 | COMP.@1'DEPTHS | 0-12 FT | H | L,M | P | Z | 181 | 10669 | FWS | *** 8/23/85 | | |
| 32- 34 | SOIL | SOIL GRID 9-0 | TOP CORE COMP. | 0-6 INCH | C | I | P | Z | 182 | 10670 | FWS | *** 8/23/85 | | |
| 32- 35 | SOIL | SOIL GRID 9-1 | MID CORE COMP. | 6-6.5 FT | C | L,M | P | Z | 183 | 10671 | | *** 8/23/85 | | |
| 32- 36 | SOIL | SOIL GRID 9-2 | BOT CORE COMP. | 11.5-12' | C | L,M | P | Z | 184 | 10672 | | *** 8/23/85 | | |
| 32- 37 | SOIL | NORTH TRANSECT 1 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 185 | 10673 | | *** 8/19/85 | | |
| 32- 38 | SOIL | NORTH TRANSECT 1 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 186 | 10674 | | *** 8/19/85 | | |
| 32- 39 | SOIL | EAST TRANSECT 1 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 187 | 10675 | | *** 8/19/85 | | |
| 32- 40 | SOIL | EAST TRANSECT 2 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 188 | 10676 | | *** 8/19/85 | | |
| 32- 41 | SOIL | SOUTH TRANSECT 1 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 189 | 10677 | | *** 8/19/85 | | |
| 32- 42 | SOIL | SOUTH TRANSECT 2 | COMP.@3' INTRVL | SURFACE | B | K | R or T | Y | 190 | 10678 | | *** 8/19/85 | | |
| 32- 43 | SEDIMENT | INT. CREEK 1-0 | GRAB | SURFACE | A | J,K | Q,R | Z | 191 | 10679 | | *** 8/22/85 | | |
| 32- 44 | SEDIMENT | INT. CREEK 1-1 | GRAB | 3 FEET | A | J,K,L | Q,R | Z | 192 | 10680 | | *** 8/22/85 | | |
| 32- 45 | SEDIMENT | INT. CREEK 1-2 | GRAB | 6 FEET | A | J,K,L | Q,R | Z | 193 | 10681 | | *** 8/22/85 | | |
| 32- 46 | SEDIMENT | INT. CREEK 2-0 | GRAB | SURFACE | A | J,K | Q,R | Z | 194 | 10682 | FWS | *** 8/22/85 | | |
| 32- 47 | SEDIMENT | INT. CREEK 2-1 | GRAB | 3 FEET | A | J,K,L | Q,R | Z | 195 | 10683 | | *** 8/22/85 | | |
| 32- 48 | SEDIMENT | INT. CREEK 2-2 | GRAB | 6 FEET | A | J,K,L | Q,R | Z | 196 | 10684 | | *** 8/22/85 | | |
| 32- 49 | SEDIMENT | INT. CREEK 3-0 | GRAB | SURFACE | A | J,K | Q,R | Z | 197 | 10685 | DUPL | *** 8/22/85 | 19257 | |
| 32- 50 | SEDIMENT | INT. CREEK 3-1 | GRAB | 3 FEET | A | J,K,L | Q,R | Z | 198 | 10686 | | *** 8/22/85 | | |
| 32- 51 | SEDIMENT | INT. CREEK 3-2 | GRAB | 6 FEET | A | J,K,L | Q,R | Z | 199 | 10687 | | *** 8/22/85 | | |
| 32- 52 | SEDIMENT | INT. CREEK 4-0 | GRAB | SURFACE | A | J,K | Q,R | Z | 200 | 10688 | FWS | *** 8/23/85 | | |
| 32- 53 | SEDIMENT | INT. CREEK 4-1 | GRAB | 3 FEET | A | J,K,L | Q,R | Z | 201 | 10689 | | *** 8/23/85 | | |
| 32- 54 | SEDIMENT | INT. CREEK 4-2 | GRAB | 6 FEET | A | J,K,L | Q,R | Z | 202 | 10690 | | *** 8/23/85 | | |
| 32- 55 | SEDIMENT | INT. CREEK 5-0 | GRAB | SURFACE | A | J,K | Q,R | Z | 203 | 10691 | DUPL | *** 8/23/85 | 19258 | |
| 32- 56 | SEDIMENT | INT. CREEK 5-1 | GRAB | 3 FEET | A | J,K,L | Q,R | Z | 204 | 10692 | | *** 8/23/85 | | |
| 32- 57 | SEDIMENT | INT. CREEK 5-2 | GRAB | 6 FEET | A | J,K,L | Q,R | Z | 205 | 10693 | | *** 8/23/85 | | |
| 32- 58 | SEDIMENT | INT. CREEK 6-0 | GRAB | SURFACE | D | J,K | Q,R | Z | 206 | 10694 | SPKE | *** 8/23/85 | 19285 | |
| 32- 59 | SEDIMENT | INT. CREEK 6-1 | GRAB | 3 FEET | D | J,K,L | Q,R | Z | 207 | 10695 | | *** 8/23/85 | | |
| 32- 60 | SEDIMENT | INT. CREEK 6-2 | GRAB | 6 FEET | D | J,K,L | Q,R | Z | 208 | 10696 | | *** 8/23/85 | | |
| 32- 61 | WATER | WELL 1 | SINGLE SAMPLE | BAILER | I | - | T | W | 209 | 10697 | | . | | |
| 32- 62 | WATER | WELL 2 | SINGLE SAMPLE | BAILER | I | - | V | W | 210 | 10698 | | . | | |
| 32- 63 | WATER | WELL 3 | SINGLE SAMPLE | BAILER | I | - | V | W | 211 | 10699 | | . | | |
| 32- 64 | SOIL | YELLOW SPOT | SINGLE SAMPLE | SURFACE | A | I | P | W | 558 | 46701 | | *** 8/26/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCATION | INSTRUMENT & NO. | SAMPLE NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|--------------------------------|-----------|-----------------|---------------|----------|----------|-------|----------|------------------|-------------|--------|-------------------|-------------------|---------------------|-------|
| 32- 65 | SOIL | BEFORE CLEANING | SINGLE SAMPLE | SURFACE | B K | T | W | 559 | 46702 | | | *** 8/26/85 | | |
| 32- 66 | SOIL | AFTER CLEANING | SINGLE SAMPLE | SURFACE | B K | T | W | 560 | 46703 | | | *** 8/26/85 | | |
| *** 33:AREA 9 BUILDING COMPLEX | | | | | | | | | | | | | | |
| 33- 1 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 212 | 10700 | | FWS | *** 9/23/85 | | |
| 33- 2 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 213 | 10701 | | | *** 9/23/85 | | |
| 33- 3 | SOIL LOC. | 1 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 214 | 10702 | | | *** 9/23/85 | | |
| 33- 4 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 215 | 10703 | DUPL | | *** 9/23/85 | 19228 | |
| 33- 5 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 216 | 10704 | | | *** 9/23/85 | | |
| 33- 6 | SOIL LOC. | 2 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 217 | 10705 | | | *** 9/23/85 | | |
| 33- 7 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 218 | 10706 | | | *** 9/23/85 | | |
| 33- 8 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 219 | 10707 | | | *** 9/23/85 | | |
| 33- 9 | SOIL LOC. | 3 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 220 | 10708 | | | *** 9/23/85 | | |
| 33- 10 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 221 | 10709 | | | *** 9/23/85 | | |
| 33- 11 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 222 | 10710 | | | *** 9/23/85 | | |
| 33- 12 | SOIL LOC. | 4 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 223 | 10711 | | | *** 9/23/85 | | |
| 33- 13 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 224 | 10712 | | | *** 9/23/85 | | |
| 33- 14 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 225 | 10713 | | | *** 9/23/85 | | |
| 33- 15 | SOIL LOC. | 5 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 226 | 10714 | | | *** 9/23/85 | | |
| 33- 16 | SOIL LOC. | 6 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 227 | 10715 | DUPL | | *** 9/23/85 | 19229 | |
| 33- 17 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 228 | 10716 | | | *** 9/23/85 | | |
| 33- 18 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 229 | 10717 | | | *** 9/23/85 | | |
| 33- 19 | SOIL LOC. | 7 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 230 | 10718 | | | *** 9/23/85 | | |
| 33- 20 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 231 | 10719 | | | *** 9/23/85 | | |
| 33- 21 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 232 | 10720 | | | *** 9/23/85 | | |
| 33- 22 | SOIL LOC. | 8 - I-1- 25 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 233 | 10721 | | | *** 9/23/85 | | |
| 33- 23 | SOIL LOC. | 9 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 234 | 10722 | DUPL | | *** 9/23/85 | 19230 | |
| 33- 24 | SOIL LOC. | 10 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 235 | 10723 | | FWS | *** 9/23/85 | | |
| 33- 25 | SOIL LOC. | 11 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 236 | 10724 | | | *** 9/23/85 | | |
| 33- 26 | SOIL LOC. | 12 - I-1- 25 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 237 | 10725 | SPKE | | *** 9/23/85 | 19270 | |
| 33- 27 | SOIL LOC. | 13 - I-1- 25 | CORE SURFACE | 0-1 FOOT | D J | Q1 | Z | 238 | 10726 | | | *** 9/23/85 | | |
| 33- 28 | SOIL LOC. | 14 - I-1- 23 | DITCH | 0-1 FOOT | B K | Q1 | Z | 239 | 10727 | | | *** 9/23/85 | | |
| 33- 29 | SOIL LOC. | 15 - I-1- 23 | CORE SURFACE | 0-6 INCH | B J | Q1 | Z | 240 | 10728 | DUPL | | *** 9/23/85 | 19231 | |
| 33- 30 | SOIL LOC. | 16 - I-1- 64 | DITCH | 0-1 FOOT | B K | Q1 | Z | 241 | 10729 | | | *** 9/23/85 | | |
| 33- 31 | SOIL LOC. | 17 - I-1- 64 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 242 | 10730 | | | *** 9/23/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOC | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|-----------|--------------|---------------|----------|-------|-------|------|--------|-------|------|-----------|-------------|-------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 33- 32 | SOIL LOC. | 18 - I-1- 22 | DITCH | 0-1 FOOT | B K | Q1 | Z | 243 | 10731 | | | *** 9/23/85 | | |
| 33- 33 | SOIL LOC. | 19 - I-1- 21 | DITCH | 0-1 FOOT | B K | Q1 | Z | 244 | 10732 | | | *** 9/23/85 | | |
| 33- 34 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 245 | 10733 | | FWS | *** 9/24/85 | | |
| 33- 35 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 246 | 10734 | | | *** 9/24/85 | | |
| 33- 36 | SOIL LOC. | 20 - I-1- 21 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 247 | 10735 | | | *** 9/24/85 | | |
| 33- 37 | SOIL LOC. | 21 - I-1- 21 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 248 | 10736 | DUPL | | *** 9/24/85 | 19232 | |
| 33- 38 | SOIL LOC. | 22 - I-1- 21 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 249 | 10737 | | | *** 9/24/85 | | |
| 33- 39 | SOIL LOC. | 23 - STAGING | DITCH | 0-1 FOOT | B K | Q1 | Z | 250 | 10738 | | | *** 9/23/85 | | |
| 33- 40 | SOIL LOC. | 24 - STAGING | DITCH | 0-1 FOOT | B K | Q1 | Z | 251 | 10739 | | | *** 9/23/85 | | |
| 33- 41 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 252 | 10740 | | | *** 9/23/85 | | |
| 33- 42 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 253 | 10741 | | | *** 9/23/85 | | |
| 33- 43 | SOIL LOC. | 25 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 254 | 10742 | | | *** 9/23/85 | | |
| 33- 44 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 255 | 10743 | | | *** 9/23/85 | | |
| 33- 45 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 256 | 10744 | | | *** 9/23/85 | | |
| 33- 46 | SOIL LOC. | 26 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 257 | 10745 | SPKE | | *** 9/23/85 | 19271 | |
| 33- 47 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 258 | 10746 | | | *** 9/23/85 | | |
| 33- 48 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 259 | 10747 | | | *** 9/24/85 | | |
| 33- 49 | SOIL LOC. | 27 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 260 | 10748 | | | *** 9/24/85 | | |
| 33- 50 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 261 | 10749 | | | *** 9/24/85 | | |
| 33- 51 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 262 | 10750 | | | *** 9/24/85 | | |
| 33- 52 | SOIL LOC. | 28 - I-1- 24 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 263 | 10751 | | | *** 9/24/85 | | |
| 33- 53 | SOIL LOC. | 29 - I-1- 24 | DITCH | 0-1 FOOT | B K | Q1 | Z | 264 | 10752 | | | *** 9/24/85 | | |
| 33- 54 | SOIL LOC. | 30 - I-1- 24 | DITCH | 0-1 FOOT | B K | Q1 | Z | 265 | 10753 | | FWS | *** 9/24/85 | | |
| 33- 55 | SOIL LOC. | 31 - I-1- 24 | DITCH | 0-1 FOOT | B K | Q1 | Z | 266 | 11641 | SPKE | | *** 9/24/85 | 19272 | |
| 33- 56 | SOIL LOC. | 32 - I-1- 24 | DITCH | 0-1 FOOT | B K | Q1 | Z | 267 | 11642 | DUPL | | *** 9/24/85 | 19233 | |
| 33- 57 | SOIL LOC. | 33 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 268 | 11643 | | | *** 9/24/85 | | |
| 33- 58 | SOIL LOC. | 34 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 269 | 11644 | | | *** 9/24/85 | | |
| 33- 59 | SOIL LOC. | 35 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 270 | 11645 | | | *** 9/24/85 | | |
| 33- 60 | SOIL LOC. | 36 - I-1- 20 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 271 | 11646 | | | *** 9/24/85 | | |
| 33- 61 | SOIL LOC. | 37 - I-1- 19 | CORE SURFACE | 0-6 INCH | B J | Q1 | Z | 272 | 11647 | | | *** 9/24/85 | | |
| 33- 62 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 273 | 11648 | | | *** 9/24/85 | | |
| 33- 63 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 274 | 11649 | | | *** 9/24/85 | | |
| 33- 64 | SOIL LOC. | 38 - I-1- 2 | CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 275 | 11650 | | | *** 9/24/85 | | |
| 33- 65 | SOIL LOC. | 39 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 276 | 11651 | DUPL | | *** 9/24/85 | 19234 | |
| 33- 66 | SOIL LOC. | 40 - I-1- 2 | CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 277 | 11652 | | FWS | *** 9/24/85 | | |
| 33- 67 | SOIL LOC. | 41 - I-1- 2 | CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 278 | 11653 | | | *** 9/24/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCATION | INTRVL | SAMP NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|--------|-----------|-----------|------------------|----------|----------|-------|----------|--------|-----------|--------|-------------------|-------------------|---------------------|-------|
| 33-68 | SOIL LOC. | 41 - I-1- | 2 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 279 | 11654 | | | *** 9/24/85 | | |
| 33-69 | SOIL LOC. | 41 - I-1- | 2 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 280 | 11655 | | | *** 9/24/85 | | |
| 33-70 | SOIL LOC. | 42 - I-1- | 2 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 281 | 11656 | | | *** 9/24/85 | | |
| 33-71 | SOIL LOC. | 43 - I-1- | 2 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 282 | 11657 | | | *** 9/24/85 | | |
| 33-72 | SOIL LOC. | 44 - I-1- | 2 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 283 | 11658 | | | *** 9/24/85 | | |
| 33-73 | SOIL LOC. | 44 - I-1- | 2 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 284 | 11659 | | | *** 9/24/85 | | |
| 33-74 | SOIL LOC. | 44 - I-1- | 2 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 285 | 11660 | | | *** 9/24/85 | | |
| 33-75 | SOIL LOC. | 45 - I-1- | 2 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 286 | 11661 | DUPL | | *** 9/24/85 | 19235 | |
| 33-76 | SOIL LOC. | 56 - I-1- | 2 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 287 | 11662 | | | *** 9/24/85 | | |
| 33-77 | SOIL LOC. | 56 - I-1- | 2 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 288 | 11663 | | | *** 9/24/85 | | |
| 33-78 | SOIL LOC. | 56 - I-1- | 2 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 289 | 11664 | | | *** 9/24/85 | | |
| 33-79 | SOIL LOC. | 57 - I-1- | 2 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 290 | 11665 | SPKE | | *** 9/24/85 | 19273 | |
| 33-80 | SOIL LOC. | 58 - I-1- | 2 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 291 | 11666 | | | *** 9/24/85 | | |
| 33-81 | SOIL LOC. | 46 - I-1- | 5 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 292 | 11667 | | | *** 9/24/85 | | |
| 33-82 | SOIL LOC. | 46 - I-1- | 5 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 293 | 11668 | | | *** 9/24/85 | | |
| 33-83 | SOIL LOC. | 46 - I-1- | 5 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 294 | 11669 | | | *** 9/24/85 | | |
| 33-84 | SOIL LOC. | 47 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 295 | 11670 | | | *** 9/24/85 | | |
| 33-85 | SOIL LOC. | 48 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 296 | 11671 | | | *** 9/24/85 | | |
| 33-86 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 297 | 11672 | | | *** 9/24/85 | | |
| 33-87 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 298 | 11673 | | | *** 9/24/85 | | |
| 33-88 | SOIL LOC. | 49 - I-1- | 5 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 299 | 11674 | | | *** 9/24/85 | | |
| 33-89 | SOIL LOC. | 50 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 300 | 11675 | FWS | | *** 9/24/85 | | |
| 33-90 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 301 | 11676 | | | *** 9/24/85 | | |
| 33-91 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 302 | 11677 | | | *** 9/24/85 | | |
| 33-92 | SOIL LOC. | 51 - I-1- | 5 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 303 | 11678 | | | *** 9/24/85 | | |
| 33-93 | SOIL LOC. | 52 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 304 | 11679 | DUPL | | *** 9/24/85 | 19236 | |
| 33-94 | SOIL LOC. | 53 - I-1- | 5 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 305 | 11680 | SPKE | | *** 9/24/85 | 19274 | |
| 33-95 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 306 | 11681 | | | *** 9/24/85 | | |
| 33-96 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 307 | 11682 | | | *** 9/24/85 | | |
| 33-97 | SOIL LOC. | 54 - I-1- | 35 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 308 | 11683 | | | *** 9/24/85 | | |
| 33-98 | SOIL LOC. | 55 - I-1- | 35 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 309 | 11684 | | | *** 9/24/85 | | |
| 33-99 | SOIL LOC. | 59 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 310 | 11685 | DUPL | | *** 9/24/85 | 19237 | |
| 33-100 | SOIL LOC. | 60 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 311 | 11686 | | | *** 9/25/85 | | |
| 33-101 | SOIL LOC. | 61 - I-1- | 1 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 312 | 11687 | | | *** 9/25/85 | | |
| 33-102 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 313 | 11688 | SPKE | | *** 9/25/85 | 19275 | |
| 33-103 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 314 | 11689 | | | *** 9/25/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL. SET | DEPTH | LOCATION | INTRVL | SAMP | LAB NO | REPLICATE | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|--------|-----------|-----------|-----------------|----------|-----------|-------|----------|--------|-------|--------|-----------|-------------------|---------------------|-------|
| 33-104 | SOIL LOC. | 62 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 315 | 11690 | | | *** 9/25/85 | | |
| 33-105 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 316 | 11691 | DUPL | | *** 9/25/85 | 19238 | |
| 33-106 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 317 | 11692 | | | *** 9/25/85 | | |
| 33-107 | SOIL LOC. | 63 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 318 | 11693 | | | *** 9/25/85 | | |
| 33-108 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 319 | 11694 | FWS | | *** 9/24/85 | | |
| 33-109 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 320 | 11695 | | | *** 9/24/85 | | |
| 33-110 | SOIL LOC. | 64 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 321 | 11696 | | | *** 9/24/85 | | |
| 33-111 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 322 | 11697 | | | *** 9/24/85 | | |
| 33-112 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 323 | 11698 | | | *** 9/24/85 | | |
| 33-113 | SOIL LOC. | 65 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 324 | 11699 | | | *** 9/24/85 | | |
| 33-114 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 325 | 11700 | | | *** 9/24/85 | | |
| 33-115 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 326 | 11701 | | | *** 9/24/85 | | |
| 33-116 | SOIL LOC. | 66 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 327 | 11702 | | | *** 9/24/85 | | |
| 33-117 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 328 | 11703 | DUPL | | *** 9/24/85 | 19239 | |
| 33-118 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 329 | 11704 | | | *** 9/24/85 | | |
| 33-119 | SOIL LOC. | 67 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 330 | 11705 | | | *** 9/24/85 | | |
| 33-120 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 331 | 11706 | SPKE | | *** 9/24/85 | 19276 | |
| 33-121 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 332 | 11707 | | | *** 9/24/85 | | |
| 33-122 | SOIL LOC. | 68 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 333 | 11708 | | | *** 9/24/85 | | |
| 33-123 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 334 | 11709 | FWS | | *** 9/24/85 | | |
| 33-124 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 335 | 11710 | | | *** 9/24/85 | | |
| 33-125 | SOIL LOC. | 69 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 336 | 11711 | | | *** 9/24/85 | | |
| 33-126 | SOIL LOC. | 70 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 337 | 11712 | | | *** 9/25/85 | | |
| 33-127 | SOIL LOC. | 71 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 338 | 11713 | DUPL | | *** 9/25/85 | 19240 | |
| 33-128 | SOIL LOC. | 72 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 339 | 11714 | | | *** 9/25/85 | | |
| 33-129 | SOIL LOC. | 73 - I-1- | 3 CORE SURFACE | 0-1 FOOT | D J | Q1 | Z | 340 | 11715 | | | *** 9/24/85 | | |
| 33-130 | SOIL LOC. | 74 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 341 | 11716 | DUPL | | *** 9/25/85 | 19241 | |
| 33-131 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 342 | 11717 | | | *** 9/23/85 | | |
| 33-132 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 343 | 11718 | | | *** 9/23/85 | | |
| 33-133 | SOIL LOC. | 75 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 344 | 11719 | | | *** 9/23/85 | | |
| 33-134 | SOIL LOC. | 76 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 345 | 11720 | DUPL | | *** 9/23/85 | 19242 | |
| 33-135 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 0-1 FOOT | B J | Q1 | Z | 346 | 11721 | | | *** 9/23/85 | | |
| 33-136 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 1-2 FEET | B J,M | Q1 | Z | 347 | 11722 | | | *** 9/23/85 | | |
| 33-137 | SOIL LOC. | 77 - I-1- | 3 CORE VERTICAL | 2-3 FEET | B J,M | Q1 | Z | 348 | 11723 | | | *** 9/23/85 | | |
| 33-138 | SOIL LOC. | 78 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 349 | 11724 | SPKE | | *** 9/23/85 | 19277 | |
| 33-139 | SOIL LOC. | 79 - I-1- | 3 CORE SURFACE | 0-1 FOOT | B J | Q1 | Z | 350 | 11725 | FWS | | *** 9/23/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOC | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE NUMBERS | NOTES |
|--------|--------|------|----------------------------|----------|------|-------|-------|--------|------|-------|-----------|-------------|------------------------|-------|
| | | | | | SET | TION | & NO. | NOS. | NO | LAB | FWS | COLL. DATE | | |
| 33-140 | SOIL | LOC. | 80 - I-1- 9 CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 351 | 11726 | | *** 9/24/85 | | |
| 33-141 | SOIL | LOC. | 80 - I-1- 5 CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 352 | 11727 | | *** 9/24/85 | | |
| 33-142 | SOIL | LOC. | 80 - I-1- 9 CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 353 | 11728 | | *** 9/24/85 | | |
| 33-143 | SOIL | LOC. | 81 - I-1- 9 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z | 354 | 11729 | | *** 9/23/85 | | |
| 33-144 | SOIL | LOC. | 82 - I-1- 9 CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z | 355 | 11730 | | *** 9/23/85 | | |
| 33-145 | SOIL | LOC. | 83 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 356 | 11731 | DUPL | *** 9/25/85 | 19243 | |
| 33-146 | SOIL | LOC. | 83 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 357 | 11732 | | *** 9/25/85 | | |
| 33-147 | SOIL | LOC. | 83 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 358 | 11733 | | *** 9/25/85 | | |
| 33-148 | SOIL | LOC. | 84 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 359 | 11734 | | *** 9/25/85 | | |
| 33-149 | SOIL | LOC. | 84 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 360 | 11735 | | *** 9/25/85 | | |
| 33-150 | SOIL | LOC. | 84 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 361 | 11736 | | *** 9/25/85 | | |
| 33-151 | SOIL | LOC. | 85 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 362 | 11737 | | *** 9/25/85 | | |
| 33-152 | SOIL | LOC. | 85 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 363 | 11738 | | *** 9/25/85 | | |
| 33-153 | SOIL | LOC. | 85 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 364 | 11739 | | *** 9/25/85 | | |
| 33-154 | SOIL | LOC. | 86 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 365 | 11740 | | *** 9/25/85 | | |
| 33-155 | SOIL | LOC. | 86 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 366 | 11741 | DUPL | *** 9/25/85 | 19244 | |
| 33-156 | SOIL | LOC. | 86 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 367 | 11742 | | *** 9/25/85 | | |
| 33-157 | SOIL | LOC. | 87 - I-1-23C CORE VERTICAL | 0-1 FOOT | D | J | Q1 | Z | 368 | 11743 | | *** 9/25/85 | | |
| 33-158 | SOIL | LOC. | 87 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 369 | 11744 | | *** 9/25/85 | | |
| 33-159 | SOIL | LOC. | 87 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 370 | 11745 | | *** 9/25/85 | | |
| 33-160 | SOIL | LOC. | 88 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 371 | 11746 | | *** 9/25/85 | | |
| 33-161 | SOIL | LOC. | 88 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 372 | 11747 | | *** 9/25/85 | | |
| 33-162 | SOIL | LOC. | 88 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 373 | 11748 | | *** 9/25/85 | | |
| 33-163 | SOIL | LOC. | 89 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 374 | 11749 | DUPL | *** 9/25/85 | 19245 | |
| 33-164 | SOIL | LOC. | 89 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 375 | 11750 | | *** 9/25/85 | | |
| 33-165 | SOIL | LOC. | 89 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 376 | 11751 | | *** 9/25/85 | | |
| 33-166 | SOIL | LOC. | 90 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 377 | 11752 | FWS | *** 9/25/85 | | |
| 33-167 | SOIL | LOC. | 90 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 378 | 11753 | | *** 9/25/85 | | |
| 33-168 | SOIL | LOC. | 90 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 379 | 11754 | SPKE | *** 9/25/85 | 19278 | |
| 33-169 | SOIL | LOC. | 91 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 380 | 11755 | | *** 9/25/85 | | |
| 33-170 | SOIL | LOC. | 91 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 381 | 11756 | SPKE | *** 9/25/85 | 19279 | |
| 33-171 | SOIL | LOC. | 91 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 382 | 11757 | | *** 9/25/85 | | |
| 33-172 | SOIL | LOC. | 92 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 383 | 11758 | | *** 9/25/85 | | |
| 33-173 | SOIL | LOC. | 92 - I-1-23C CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 384 | 11759 | | *** 9/25/85 | | |
| 33-174 | SOIL | LOC. | 92 - I-1-23C CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 385 | 11760 | DUPL | *** 9/25/85 | 19246 | |
| 33-175 | SOIL | LOC. | 93 - I-1-23C CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 386 | 11761 | | *** 9/25/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOC | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|--------|------|---------------|---------------|----------|-------|-------|--------|------|-----|-----------|--------|-------------|---------------|
| | | | | | SET | TION | & NO. | NOS. | NO | LAB | FWS | COLL. | DATE | NUMBERS |
| 33-176 | SOIL | LDC. | 93 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 387 | 11762 | *** | 9/25/85 | |
| 33-177 | SOIL | LDC. | 93 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 388 | 11763 | *** | 9/25/85 | |
| 33-178 | SOIL | LDC. | 94 - I-1-23C | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z | 389 | 11764 | *** | 9/25/85 | |
| 33-179 | SOIL | LDC. | 95 - I-1-23C | CORE SURFACE | 0-1 FOOT | B | J | Q1 | Z | 390 | 11765 | *** | 9/25/85 | |
| 33-180 | SOIL | LDC. | 96 - I-1-23C | CORE VERTICAL | 0-1 FOOT | B | J | Q1 | Z | 391 | 11766 | DUPL | *** | 9/25/85 19247 |
| 33-181 | SOIL | LDC. | 96 - I-1-23C | CORE VERTICAL | 1-2 FEET | B | J,M | Q1 | Z | 392 | 11767 | *** | 9/25/85 | |
| 33-182 | SOIL | LDC. | 96 - I-1-23C | CORE VERTICAL | 2-3 FEET | B | J,M | Q1 | Z | 393 | 11768 | *** | 9/25/85 | |
| 33-183 | SOIL | LDC. | 97 - I-1- 9 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 394 | 11769 | *** | 9/25/85 | |
| 33-184 | SOIL | LDC. | 98 - I-1- 15 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 395 | 11770 | *** | 9/25/85 | |
| 33-185 | SOIL | LDC. | 99 - I-1- 1 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 396 | 11771 | *** | 9/25/85 | |
| 33-186 | SOIL | LDC. | 100 - I-1- 29 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 397 | 11772 | *** | 9/25/85 | |
| 33-187 | SOIL | LDC. | 101 - I-1- 8 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 398 | 11773 | DUPL | *** | 9/25/85 19248 |
| 33-188 | SOIL | LDC. | 102 - I-1- 8 | SURFACE COMP. | 0-1 FOOT | B | J | Q1 | X | 399 | 11774 | FWS | *** | 9/25/85 |
| 33-189 | SOIL | - | SPARE NUMBERS | | B | | | | | 400 | 11775 | | | |
| 33-190 | SOIL | - | SPARE NUMBERS | | B | | | | | 401 | 11776 | | | |
| 33-191 | SOIL | - | SPARE NUMBERS | | B | | | | | 402 | 11777 | | | |
| 33-192 | SOIL | - | SPARE NUMBERS | | B | | | | | 403 | 11778 | | | |
| 33-193 | SOIL | - | SPARE NUMBERS | | B | | | | | 404 | 11779 | | | |
| 33-194 | SOIL | - | SPARE NUMBERS | | B | | | | | 405 | 11780 | | | |
| 33-195 | SOIL | - | SPARE NUMBERS | | B | | | | | 406 | 11781 | | | |
| 33-196 | SOIL | - | SPARE NUMBERS | | B | | | | | 407 | 11782 | | | |
| 33-197 | SOIL | - | SPARE NUMBERS | | B | | | | | 408 | 11783 | | | |
| 33-198 | SOIL | - | SPARE NUMBERS | | B | | | | | 409 | 11784 | | | |
| 33-199 | SOIL | - | SPARE NUMBERS | | B | | | | | 410 | 11785 | | | |
| 33-200 | SOIL | - | SPARE NUMBERS | | B | | | | | 411 | 11786 | | | |
| 33-201 | SOIL | - | SPARE NUMBERS | | B | | | | | 412 | 11787 | | | |

*** 35: AREA 9 EAST WATERWAY

| | | | | | | | | | | | | | | |
|-----|---|----------|----------|---------------|--------|---|---|---|---|-----|-------|-----|----------|--|
| 35- | 1 | SEDIMENT | WATERWAY | COMP. 5 GRABS | 0-1 FT | A | I | P | Y | 548 | 19208 | *** | 8/13/85 | |
| 35- | 1 | SEDIMENT | WATERWAY | COMP. 5 GRABS | 0-1 FT | F | I | P | Y | 598 | 5263 | *** | 11/18/85 | |

*** #12 34: CRAB ORCHARD LAKE

| | | | | | | | | | | | | | | |
|-----|---|-------|---------------|------|----|---|---|---|---|-----|------|-----|---------|--|
| 34- | 1 | WATER | REFUGE INTAKE | GRAB | NA | E | - | T | W | 413 | 3252 | *** | 7/24/85 | |
| 34- | 2 | WATER | MARION INTAKE | GRAB | NA | E | - | T | W | 414 | 3251 | *** | 7/24/85 | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOCA | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|----------|--------------------|-----------------|-------------|------|-------|------|--------|------|-------|-----------|-------------|-------------|------------------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 34- 3 | WATER | MARION RES.-INTAKE | GRAB | NA | E | - | T | W | 415 | 3253 | | *** 7/25/85 | | Resamp. 9/24/85 |
| 34- 4 | WATER | REFUGE TREATED H2O | GRAB | NA | E | - | T | W | 416 | 3246 | | *** 7/24/85 | | Resamp. 9/24/85 |
| 34- 5 | WATER | MARION TREATED H2O | GRAB | NA | E | - | T | W | 417 | 3255 | | *** 7/25/85 | | Resamp. 9/24/85 |
| 34- 6 | WATER | LAKE 1 B | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 418 | 11788 | | . | | |
| 34- 7 | WATER | LAKE 2 C | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 419 | 11789 | | . | | |
| 34- 8 | WATER | LAKE 3 G | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 420 | 11790 | | . | | |
| 34- 9 | WATER | LAKE 4 H | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 421 | 11791 | | . | | |
| 34- 10 | WATER | LAKE 5 A | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 422 | 11792 | | . | | |
| 34- 11 | WATER | LAKE 6 D | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 423 | 11793 | | . | | |
| 34- 12 | WATER | LAKE 7 E | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 424 | 11794 | | . | | |
| 34- 13 | WATER | LAKE 8 F | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 425 | 11795 | | . | | |
| 34- 14 | WATER | LAKE 9 I | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 426 | 11796 | | . | | |
| 34- 15 | WATER | LAKE 10J | COMP.3 DEPTHS | SURF-0.8 FT | I | O | S | W | 427 | 19159 | | . | | |
| 34- 16 | SEDIMENT | LAKE 1 B | GRAB | DREDGE | H | K | S | W | 428 | 19160 | | . | | |
| 34- 17 | SEDIMENT | LAKE 2 C | GRAB | DREDGE | H | K | S | W | 429 | 19161 | | . | | |
| 34- 18 | SEDIMENT | LAKE 3 G | GRAB | DREDGE | I | K | S | W | 430 | 19162 | FWS | . | | |
| 34- 19 | SEDIMENT | LAKE 4 H | GRAB | DREDGE | I | K | S | W | 431 | 19163 | | . | | |
| 34- 20 | SEDIMENT | LAKE 5 A | GRAB | DREDGE | I | K | S | W | 432 | 19164 | | . | | |
| 34- 21 | SEDIMENT | LAKE 6 D | GRAB | DREDGE | I | K | S | W | 433 | 19165 | | . | | |
| 34- 22 | SEDIMENT | LAKE 7 E | GRAB | DREDGE | I | K | S | W | 434 | 19166 | | . | | |
| 34- 23 | SEDIMENT | LAKE 8 F | GRAB | DREDGE | I | K | S | W | 435 | 19167 | | . | | |
| 34- 24 | SEDIMENT | LAKE 9 I | GRAB | DREDGE | I | K | S | W | 436 | 19168 | | . | | |
| 34- 25 | SEDIMENT | LAKE 10J | GRAB | DREDGE | I | | | | 437 | 19169 | | . | | |
| 34- 26 | FISH | LAKE SITE 1 B | COMP. 5 CARP | NA | I | | | | 438 | 19170 | | *** 7/23/85 | | |
| 34- 27 | FISH | LAKE SITE 1 B | COMP. 5 BASS | NA | I | | | | 439 | 19171 | | *** 7/23/85 | | |
| 34- 28 | FISH | LAKE SITE 1 B | COMP. 5 BASS | NA | I | | | | 440 | 19172 | | *** 7/23/85 | | |
| 34- 48 | FISH | LAKE SITE 1 B | COMP.5 BULLHEAD | NA | I | | | | 460 | 19192 | FWS | *** 7/23/85 | | |
| 34- 49 | FISH | LAKE SITE 1 B | COMP.5 BULLHEAD | NA | I | | | | 461 | 19193 | | *** 7/23/85 | | |
| 34- 50 | FISH | LAKE SITE 1 B | COMP.2 CATFISH | NA | I | | | | 462 | 19194 | | *** 7/23/85 | | 3 bullhead 11/85 |
| 34- 29 | FISH | LAKE SITE 2 C | COMP. 5 CARP | NA | H | | | | 441 | 19173 | FWS | *** 7/23/85 | | |
| 34- 30 | FISH | LAKE SITE 2 C | COMP. 5 CARP | NA | I | | | | 442 | 19174 | | *** 7/23/85 | | |
| 34- 31 | FISH | LAKE SITE 2 C | COMP. 5 BASS | NA | H | | | | 443 | 19175 | | *** 7/23/85 | | |
| 34- 51 | FISH | LAKE SITE 2 C | COMP.5 BULLHEAD | NA | I | | | | 463 | 19195 | | *** 7/23/85 | | |
| 34- 52 | FISH | LAKE SITE 2 C | COMP.5 BULLHEAD | NA | I | | | | 464 | 19196 | | *** 7/23/85 | | |
| 34- 53 | FISH | LAKE SITE 2 C | COMP.5 CATFISH | NA | I | | | | 465 | 19197 | | *** 7/23/85 | | |
| 34- 32 | FISH | LAKE SITE 3 G | COMP. 5 CARP | NA | I | | | | 444 | 19176 | | *** 7/23/85 | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL SET | DEPTH | LOCAT | INTRVL & NO. | SAMP NOS. | LAB NO | REPLICATE LAB FWS | SAMPLE COLL. DATE | DUPL./SPIKE NUMBERS | NOTES |
|--------|----------------------|-------------------------|------------------|---------|----------|-------|-------|--------------|-----------|------------|-------------------|-------------------|---------------------|------------------|
| 34- 33 | FISH | LAKE SITE 3 G | COMP. 5 CARP | NA | I | | | | 445 | 19177 | | *** 7/23/85 | | |
| 34- 34 | FISH | LAKE SITE 3 G | COMP. 5 BASS | NA | I | | | | 446 | 19178 | FWS | *** 7/23/85 | | FWS 11/85 |
| 34- 54 | FISH | LAKE SITE 3 G | COMP. 5 BULLHEAD | NA | I | | | | 466 | 19198 | | *** 7/23/85 | | |
| 34- 55 | FISH | LAKE SITE 3 G | COMP. 5 BULLHEAD | NA | I | | | | 467 | 19199 | | *** 7/23/85 | | |
| 34- 35 | FISH | LAKE SITE 4 H | COMP. 5 CARP | NA | I | | | | 447 | 19179 | FWS | *** 7/24/85 | | |
| 34- 36 | FISH | LAKE SITE 4 H | COMP. 5 BASS | NA | I | | | | 448 | 19180 | | *** 7/24/85 | | |
| 34- 37 | FISH | LAKE SITE 4 H | COMP. 5 BASS | NA | I | | | | 449 | 19181 | | *** 7/24/85 | | |
| 34- 59 | FISH | LAKE SITE 4 H | COMP. 5 BULLHEAD | NA | I | | | | 472 | 19200 | | *** 7/24/85 | | |
| 34- 60 | FISH | LAKE SITE 4 H | COMP. 5 BULLHEAD | NA | I | | | | 473 | 19201 | | *** 7/24/85 | | |
| 34- 61 | FISH | LAKE SITE 4 H | COMP. 4 CATFISH | NA | I | | | | 471 | 19202 | | *** 7/24/85 | | 1 bullhead 11/85 |
| 34- 38 | FISH | LAKE CONTROL J | COMP. 5 CARP | NA | I | | | | 450 | 19182 | | *** 7/24/85 | | |
| 34- 39 | FISH | LAKE CONTROL J | COMP. 5 CARP | NA | I | | | | 451 | 19183 | | *** 7/24/85 | | |
| 34- 40 | FISH | LAKE CONTROL J | COMP. 3 BASS | NA | I | | | | 452 | 19184 | FWS | *** 7/24/85 | | 1 FWS 11/85 |
| 34- 41 | FISH | LAKE CONTROL J | COMP. 5 BASS | NA | I | | | | 453 | 19185 | | *** 7/24/85 | | |
| 34- 56 | FISH | LAKE CONTROL J | COMP. 5 BULLHEAD | NA | I | | | | 468 | 19203 | | *** 7/24/85 | | |
| 34- 57 | FISH | LAKE CONTROL J | COMP. 5 BULLHEAD | NA | I | | | | 469 | 19204 | | *** 7/24/85 | | |
| 34- 58 | FISH | LAKE CONTROL J | COMP. 3 CATFISH | NA | I | | | | 470 | 19205 | | *** 7/24/85 | | 2 bullhead 11/85 |
| 34- 42 | TURTLES | LAKE SITE 1 B | COMP. OF 2 | BOTTOM | I | | | | 454 | 19186 | | --- 7/24/85 | | |
| 34- 43 | TURTLES | LAKE SITE 2 C | COMP. OF 2 | BOTTOM | I | | | | 455 | 19187 | | --- 7/24/85 | | |
| 34- 44 | TURTLES | LAKE SITE 3 G | COMP. OF 2 | BOTTOM | I | | | | 456 | 19188 | | --- 7/24/85 | | |
| 34- 45 | CRAYFISH | LAKE SITE 1 B | COMP. OF 300gms | SURFACE | I | | | | 457 | 19189 | | --- 7/24/85 | | |
| 34- 46 | CRAYFISH | LAKE SITE 2 C | COMP. OF 300gms | SURFACE | I | | | | 458 | 19190 | | --- 7/24/85 | | |
| 34- 47 | CRAYFISH | LAKE SITE 3 G | COMP. OF 300gms | SURFACE | I | | | | 459 | 19191 | | --- 7/24/85 | | |
| *** | #13 | 31: REFUGE CONTROL SITE | | | | | | | | | | | | |
| 31- 1 | SOIL | REFUGE CONTROL | SINGLE SAMPLE | SURFACE | D | -- | T | W | 474 | 19206 | | *** 8/14/85 | | Near dead tree |
| 31- 1 | SOIL | REFUGE CONTROL | SINGLE SAMPLE | SURFACE | G | -- | T | W | 599 | 9284 | | *** 11/19/85 | | |
| 31- 2 | WATER | REFUGE CONTROL | SINGLE SAMPLE | BAILER | I | -- | T | W | 475 | 19207 | | . | | |
| *** | #14 | 40: DUPLICATES | | | | | | | | | | | | |
| 40- 1 | WATER | | DUPLICATE | | A | | | | 476 | 19215 DUPL | | *** 8/13/85 | 9467 | |
| 40- 2 | WATER - SPARE NUMBER | | DUPLICATE | | I | | | | 477 | 19216 | | | | |
| 40- 3 | WATER | | DUPLICATE | | I | | | | 478 | 19217 DUPL | | . | | |
| 40- 4 | WATER | | DUPLICATE | | I | | | | 479 | 19218 DUPL | | . | | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL! | ! DEPTH! | ! LOCAL! | ! INTRVL! | ! SAMP! | ! LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|-----------|------|----------------|---------|---------|----------|----------|-----------|---------|-------|-----------|--------------|-------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 40- 5 | WATER | | DUPLICATE-WELL | | I | | | | 480 | 19219 | DUPL | . | | |
| 40- 6 | WATER | | DUPLICATE-WELL | | I | | | | 481 | 19220 | DUPL | . | | |
| 40- 7 | SOIL | | DUPLICATE | | A | | | | 482 | 19221 | DUPL | *** 8/14/85 | 9402 | |
| 40- 8 | SOIL | | DUPLICATE | | F | | | | 483 | 19222 | DUPL | *** 11/19/85 | 9251 | |
| 40- 9 | SOIL | | DUPLICATE | | A | | | | 484 | 19223 | DUPL | *** 8/15/85 | 9453 | |
| 40- 10 | SOIL | | DUPLICATE | | A | | | | 485 | 19224 | DUPL | *** 8/14/85 | 9463 | |
| 40- 11 | SEDIMENT | | DUPLICATE | | F | | | | 486 | 19225 | DUPL | *** 11/18/85 | 9261 | |
| 40- 12 | SOIL | | DUPLICATE | | A | | | | 487 | 19226 | DUPL | *** 8/17/85 | 9417 | |
| 40- 13 | SOIL | | DUPLICATE | | G | | | | 488 | 19227 | DUPL | *** 11/18/85 | 9270 | |
| 40- 14 | SOIL | | DUPLICATE | | B | | | | 489 | 19228 | DUPL | *** 9/23/85 | 10703 | |
| 40- 15 | SOIL | | DUPLICATE | | B | | | | 490 | 19229 | DUPL | *** 9/23/85 | 10715 | |
| 40- 16 | SOIL | | DUPLICATE | | B | | | | 491 | 19230 | DUPL | *** 9/23/85 | 10722 | |
| 40- 17 | SOIL | | DUPLICATE | | B | | | | 492 | 19231 | DUPL | *** 9/23/85 | 10728 | |
| 40- 18 | SOIL | | DUPLICATE | | B | | | | 493 | 19232 | DUPL | *** 9/24/85 | 10736 | |
| 40- 19 | SOIL | | DUPLICATE | | B | | | | 494 | 19233 | DUPL | *** 9/23/85 | 11642 | |
| 40- 20 | SOIL | | DUPLICATE | | B | | | | 495 | 19234 | DUPL | *** 9/24/85 | 11651 | |
| 40- 21 | SOIL | | DUPLICATE | | B | | | | 496 | 19235 | DUPL | *** 9/24/85 | 11661 | |
| 40- 22 | SOIL | | DUPLICATE | | B | | | | 497 | 19236 | DUPL | *** 9/24/85 | 11679 | |
| 40- 23 | SOIL | | DUPLICATE | | B | | | | 498 | 19237 | DUPL | *** 9/24/85 | 11685 | |
| 40- 24 | SOIL | | DUPLICATE | | E | | | | 499 | 19238 | DUPL | *** 9/25/85 | 11691 | |
| 40- 25 | SOIL | | DUPLICATE | | B | | | | 500 | 19239 | DUPL | *** 9/24/85 | 11703 | |
| 40- 26 | SOIL | | DUPLICATE | | B | | | | 501 | 19240 | DUPL | *** 9/25/85 | 11713 | |
| 40- 27 | SOIL | | DUPLICATE | | B | | | | 502 | 19241 | DUPL | *** 9/25/85 | 11716 | |
| 40- 28 | SOIL | | DUPLICATE | | B | | | | 503 | 19242 | DUPL | *** 9/23/85 | 11719 | |
| 40- 29 | SOIL | | DUPLICATE | | B | | | | 504 | 19243 | DUPL | *** 9/25/85 | 11731 | |
| 40- 30 | SOIL | | DUPLICATE | | B | | | | 505 | 19244 | DUPL | *** 9/25/85 | 11741 | |
| 40- 31 | SOIL | | DUPLICATE | | B | | | | 506 | 19245 | DUPL | *** 9/25/85 | 11749 | |
| 40- 32 | SOIL | | DUPLICATE | | B | | | | 507 | 19246 | DUPL | *** 9/25/85 | 11760 | |
| 40- 33 | SOIL | | DUPLICATE | | B | | | | 508 | 19247 | DUPL | *** 9/25/85 | 11766 | |
| 40- 34 | SOIL | | DUPLICATE | | B | | | | 509 | 19248 | DUPL | *** 9/25/85 | 11773 | |
| 40- 35 | SOIL | | DUPLICATE | | C | | | | 510 | 19249 | DUPL | *** 8/22/85 | 10654 | |
| 40- 36 | SOIL | | DUPLICATE | | C | | | | 511 | 19250 | DUPL | *** 8/24/85 | 9500 | |
| 40- 37 | SOIL | | DUPLICATE | | C | | | | 512 | 19251 | DUPL | *** 8/22/85 | 10660 | |
| 40- 38 | SOIL | | DUPLICATE | | H | | | | 513 | 19252 | DUPL | *** 8/22/85 | 10661 | |
| 40- 39 | SOIL | | DUPLICATE | | D | | | | 514 | 19253 | DUPL | *** 8/17/85 | 9398 | |
| 40- 40 | SEDIMENT | | DUPLICATE | | A | | | | 515 | 19254 | DUPL | *** 8/16/85 | 9429 | |

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PHASE I SAMPLING AND ANALYSIS SCHEDULE

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| I.D. | MATRIX | NAME | TYPE | DEPTH | ANAL | DEPTH | LOCA | INTRVL | SAMP | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|----------|------------------|-----------|-------|------|-------|------|--------|------|-------|-----------|--------------|-------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 40- 41 | SEDIMENT | | DUPLICATE | | A | | | | 516 | 19255 | DUPL | *** 8/16/85 | 19210 | |
| 40- 42 | SEDIMENT | | DUPLICATE | | A | | | | 517 | 19256 | DUPL | *** 8/13/85 | 9468 | |
| 40- 43 | SEDIMENT | | DUPLICATE | | A | | | | 518 | 19257 | DUPL | *** 8/22/85 | 10685 | |
| 40- 44 | SEDIMENT | | DUPLICATE | | A | | | | 519 | 19258 | DUPL | *** 8/23/85 | 10691 | |
| 40- 45 | SEDIMENT | | DUPLICATE | | G | | | | 520 | 19259 | DUPL | *** 11/19/85 | 9262 | |
| 40- 46 | SEDIMENT | | DUPLICATE | | I | | | | 521 | 19260 | DUPL | . | | |
| 40- 47 | SEDIMENT | | DUPLICATE | | I | | | | 522 | 19261 | DUPL | . | | |
| 40- 48 | SOIL | | DUPLICATE | | A | | | | 549 | 19287 | DUPL | *** 8/13/85 | 9491 | |
| 40- 49 | SOIL | | DUPLICATE | | D | | | | 551 | 19289 | DUPL | *** 8/16/85 | 9461 | |
| 40- 50 | SOIL | | DUPLICATE | | D | | | | 552 | 19290 | DUPL | *** 8/16/85 | 9443 | |
| 40- 51 | SOIL | | DUPLICATE | | D | | | | 553 | 19291 | DUPL | *** 8/14/85 | 9473 | |
| 40- 52 | SEDIMENT | EXPLOSIVES ANAL. | DUPLICATE | | A | | | | 555 | 9255 | DUPL | *** 7/25/85 | 3367 | |
| 40- 53 | SEDIMENT | | DUPLICATE | | H | | | | 601 | 9266 | DUPL | . | | |

*** 41:SPIKES

| | | | | | | | | | | | | | | |
|--------|----------|--|-------|-------|---|--|--|--|-----|-------|------|--------------|-------|--|
| 41- 1 | SEDIMENT | | SPIKE | | F | | | | 523 | 19262 | SPKE | *** 12/05/85 | 9276 | |
| 41- 2 | SOIL | | SPIKE | | G | | | | 524 | 19263 | SPKE | *** 11/19/85 | 9261 | |
| 41- 3 | WATER | | SPIKE | | I | | | | 525 | 19264 | SPKE | . | | |
| 41- 4 | WATER | | SPIKE | -WELL | I | | | | 526 | 19265 | SPKE | . | | |
| 41- 5 | SOIL | | SPIKE | | A | | | | 527 | 19266 | SPKE | *** 8/14/85 | 9403 | |
| 41- 6 | SOIL | | SPIKE | | A | | | | 528 | 19267 | SPKE | *** 8/17/85 | 9436 | |
| 41- 7 | SOIL | | SPIKE | | A | | | | 529 | 19268 | SPKE | *** 8/16/85 | 9459 | |
| 41- 8 | SOIL | | SPIKE | | A | | | | 530 | 19269 | SPKE | *** 8/14/85 | 9481 | |
| 41- 9 | SOIL | | SPIKE | | B | | | | 531 | 19270 | SPKE | *** 9/23/85 | 10725 | |
| 41- 10 | SOIL | | SPIKE | | B | | | | 532 | 19271 | SPKE | *** 9/23/85 | 10745 | |
| 41- 11 | SOIL | | SPIKE | | B | | | | 533 | 19272 | SPKE | *** 9/23/85 | 11641 | |
| 41- 12 | SOIL | | SPIKE | | B | | | | 534 | 19273 | SPKE | *** 9/24/85 | 11665 | |
| 41- 13 | SOIL | | SPIKE | | B | | | | 535 | 19274 | SPKE | *** 9/24/85 | 11680 | |
| 41- 14 | SOIL | | SPIKE | | B | | | | 536 | 19275 | SPKE | *** 9/25/85 | 11688 | |
| 41- 15 | SOIL | | SPIKE | | B | | | | 537 | 19276 | SPKE | *** 9/24/85 | 11706 | |
| 41- 16 | SOIL | | SPIKE | | B | | | | 538 | 19277 | SPKE | *** 9/23/85 | 11724 | |
| 41- 17 | SOIL | | SPIKE | | B | | | | 539 | 19278 | SPKE | *** 9/25/85 | 11754 | |
| 41- 18 | SOIL | | SPIKE | | B | | | | 540 | 19279 | SPKE | *** 9/25/85 | 11756 | |
| 41- 19 | SOIL | | SPIKE | | C | | | | 541 | 19280 | SPKE | *** 8/23/85 | 10666 | |
| 41- 20 | SOIL | | SPIKE | | H | | | | 542 | 19281 | SPKE | *** 8/23/85 | 10665 | |

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING AND ANALYSIS SCHEDULE

REVISED NOVEMBER 1985

| ! I.D. | ! MATRIX! | NAME | ! TYPE | ! DEPTH | ! ANAL! | DEPTH! | LOCA-! | INTRVL! | SAMP!! | LAB | REPLICATE | SAMPLE | DUPL./SPIKE | NOTES |
|--------|--------------|------------------|--------|---------|---------|--------|--------|---------|--------|-------|-----------|--------------|-------------|-------|
| | | | | | SET | | TION | & NO. | NOS. | NO | LAB FWS | COLL. DATE | NUMBERS | |
| 41- 21 | SEDIMENT | | SPIKE | | A | | | | 543 | 19282 | SPKE | *** 8/16/85 | 9427 | |
| 41- 22 | FISH - SPARE | | SPIKE | | I | | | | 544 | 19283 | | | | |
| 41- 23 | FISH - SPARE | | SPIKE | | I | | | | 545 | 19284 | | | | |
| 41- 24 | SEDIMENT | | SPIKE | | D | | | | 546 | 19285 | SPKE | *** 8/23/85 | 10694 | |
| 41- 25 | SEDIMENT | | SPIKE | | I | | | | 547 | 19286 | SPKE | . | | |
| 41- 26 | SOIL | | SPIKE | | A | | | | 550 | 19288 | SPKE | *** 8/13/85 | 9487 | |
| 41- 27 | SOIL | EXPLOSIVES ANAL. | SPIKE | | D | | | | 557 | 46700 | SPKE | *** 7/25/85 | 3385 | |
| 41- 28 | SOIL | | SPIKE | | D | | | | 561 | 9256 | SPKE | *** 7/25/85 | 46700 | |
| 41- 29 | SOIL | | SPIKE | | A | | | | 562 | 85576 | SPKE | *** 8/13/85 | 9467 | |
| 41- 30 | SOIL | | SPIKE | | A | | | | 569 | 14138 | SPKE | *** 8/14/85 | 9463 | |
| *** | | 42:BLANKS | | | | | | | | | | | | |
| 42- 1 | SOIL | FIELD - SAND | BLANK | | D | | | | 554 | 19292 | BLNK | *** 8/19/85 | | |
| 42- 2 | SOIL | EXPLOSIVES ANAL. | BLANK | | A | | | | 556 | 46699 | BLNK | *** 8/19/85 | | |
| 42- 3 | SOIL | OB&G LAB | BLANK | | A | | | | 563 | 85575 | BLNK | *** 8/19/85 | | |
| 42- 4 | SOIL | OB&G LAB | BLANK | | A | | | | 564 | 46453 | BLNK | *** 8/19/85 | | |
| 42- 5 | SOIL | OB&G LAB | BLANK | | A | | | | 565 | 85608 | BLNK | *** 8/19/85 | | |
| 42- 6 | SOIL | OB&G LAB | BLANK | | A | | | | 566 | 14139 | BLNK | *** 8/19/85 | | |
| 42- 7 | SOIL | OB&G LAB | BLANK | | A | | | | 567 | 2994 | BLNK | *** 8/19/85 | | |
| 42- 8 | SOIL | OB&G LAB | BLANK | | A | | | | 568 | 2993 | BLNK | *** 8/19/85 | | |
| 42- 9 | SOIL | OB&G LAB | BLANK | | A | | | | 570 | 46508 | BLNK | *** 8/23/85 | | |
| 42- 10 | SOIL | OB&G LAB | BLANK | | A | | | | 571 | 46683 | BLNK | *** 8/26/85 | | |
| 42- 11 | SOIL | OB&G LAB | BLANK | | G | | | | 600 | 9285 | BLNK | *** 11/20/85 | | |
| 42- 12 | SOIL | OB&G LAB | BLANK | | G | | | | 602 | 9287 | BLNK | . | | |
| 42- 13 | SOIL | OB&G LAB | BLANK | | H | | | | 603 | 9288 | BLNK | . | | |
| 42- 14 | SOIL | OB&G LAB | BLANK | | I | | | | 604 | 9269 | BLNK | . | | |

END

DRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING

SAMPLE LABELS

GRP: 11 SITE: STARON 11 ACID POND

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 SURGEABLES 60ML SCREWDRP VIAL FILL 1/2WAY

GULLS

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 ACID/BASE 11 GLASS,TEFLON

ICWCP

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 MERCURY 1/2FT PLASTIC CONC HNO3

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 1000MGF 1FT PLASTIC H2SO4

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 EXPLOSIVES 100 ML PLASTIC KEEP MOIST

CONWR

STARON 11 ACID POND : SAMPLE NO. 9409
 SOIL - 2- 1 (9) DEAD TREE AREA
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 SURGEABLES 60ML GRINDP VIAL FILL 1/2WAY

CONWR

STARON 11 ACID POND : SAMPLE NO. 9409
 SOIL - 2- 1 (9) DEAD TREE AREA
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 EXPLOSIVES 60ML GLASS JAR KEEP MOIST

CONWR

STARON 11 ACID POND : SAMPLE NO. 9410
 SEDIMENT- 3- 3 (10) POND SED.
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 SURGEABLES 60ML GRINDP VIAL FILL 1/2WAY

CONWR

STARON 11 ACID POND : SAMPLE NO. 9410
 SEDIMENT- 3- 3 (10) POND SED.
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 EXPLOSIVES 60ML GLASS JAR KEEP MOIST

DRAB ORCHARD NATIONAL WILDLIFE REFUGE

PHASE I SAMPLING

SAMPLE LABELS

GRP: 11 SITE: STARON 11 ACID POND

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 6FLAGEABLES 60ML SCREWDRP VIAL FILL 1/2WAY

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 ICP 1/2FT PLASTIC CONC HNO3

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 CYANIDE 1FT PLASTIC CAUSTIC

CONWR

STARON 11 ACID POND : SAMPLE NO. 9408
 WATER - 1- 2 (8) POND WATER
 COMP. 4 GRASS SURFACE ANAL.SET A
 TOX 125ML PLASTIC CHLORIDE

CONWR

STARON 11 ACID POND : SAMPLE NO. 9409
 SOIL - 2- 1 (9) DEAD TREE AREA
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 ALL OTHER 1FT GLASS JAR,TEFLON

CONWR

STARON 11 ACID POND : SAMPLE NO. 9409
 SOIL - 2- 1 (9) DEAD TREE AREA
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 ICP 1/2FT GLASS JAR

CONWR

STARON 11 ACID POND : SAMPLE NO. 9410
 SEDIMENT- 3- 3 (10) POND SED.
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 ALL OTHER 1FT GLASS JAR,TEFLON

CONWR

STARON 11 ACID POND : SAMPLE NO. 9410
 SEDIMENT- 3- 3 (10) POND SED.
 COMP. 4 GRASS 0-1 FT ANAL.SET A
 ICP 1/2FT GLASS JAR

CRAB ORCHARB NATIONAL WILDLIFE REFUGE
FIELD NOTES

DATE: *July 25 1985*

GROUP NO.

SITE NO.

DESCRIPTION:

14

| SAMPLE NO | NOTES |
|----------------------------|---|
| <i>56</i> 56 | <i>6 water grabs from North</i> |
| | <i>ditch.</i> |
| <i>57</i> | <i>6 sediment grabs from North ditch</i> |
| <i>58</i> | <i>6 water grabs from South ditch</i> |
| <i>59</i> | <i>6 sediment grabs from South ditch.</i> |
| | <i>4 Composite Samples.</i> |
| | <i>2 - Water.</i> |
| | <i>2 - Sediment.</i> |
| | <i>oil in (14-4) #59 sediment grabs.</i> |



O'BRIEN & GERE

10/4

CHAIN OF CUSTODY RECORD

Collected 7/24/85

SAMPLERS: (signature)

Bryce

M. Swirk

M. Schwab

D. Ruelle

Shipped Federal Express

| Group No. | Site No. | Description | DATE | TIME | SAMPLE TYPE | Samp No. | NO. OF CONTAINERS | Anal. Set | Remarks |
|-----------|----------|----------------|---------|------|-------------|----------|-------------------|-----------|---------|
| 12 | 34-1 | Ref. Intake | 7/24/85 | PM | water | 413 | 4 | E | |
| 12 | 34-2 | Man Intake | | | water | 414 | 4 | E | |
| 12 | 34-4 | Ref. Treatment | | | water | 416 | 4 | E | |
| 8 | 22-1 | Old Shop | | | Water | 418 | 9 | A | |
| 8 | 22-2 | Old Shop | | | Sediment | 109 | 4 | A | |
| 2 | 27-2 | SE Drainage | 7/25/85 | AM | sediment | 36 | 4 | A | |
| 2 | 8-1 | SW Drainage | | | water | 37 | 9 | A | |
| 2 | 8-2 | " | | | Sediment | 38 | 4 | A | |
| 2 | 9-1 | NW Drainage | | | water | 39 | 9 | A | |
| 2 | 9-2 | " | | | Sed | 40 | 4 | A | |
| 2 | 10-1 | GW N Drain | | | water | 41 | 9 | A | |
| 2 | 10-2 | " | | | Sed. | 42 | 4 | D | |

Relinquished by: (Signature)

Received by: (Signature)

Date/Time

7/26/85

Relinquished by: (Signature)

Received by: (Signature)

Date/Time

Relinquished by: (Signature)

Received by: (Signature)

Date/Time

Relinquished by: (Signature)

Received by Mobile Laboratory for field analysis: (Signature)

Date/Time

Dispatched by: (Signature)

Date/Time

Received for Laboratory by:

Date/Time

7/27/85

Method of Shipment:

TAFL ZSAMPLES.IYER

TAFL C02

ZSAMPLES SAVED 12:42 AUG 11 '85

CONWR SAMPLING AND ANALYSIS SCHEDULE : AT 12:45 AUG 11, 1985

INPUT SEQUENCE OF SAMPLE NUMBERS FOR EACH DATE

DATES SHOULD BE ENTERED AS SAY 08/04/85

SAMPLE NUMBERS SHOULD BE ENTERED WITH A SPACE BETWEEN EACH

ENTER SAMPLING DATE : 07/25/85

ENTER SAMPLE NUMBERS :

42 44 2711 3243-3258 3384-3391 9383-9384 9394-9397 19301-19310

DO YOU WISH TO RE\$-ENTER (Y OR N): N

MORE NUMBERS (Y OR N) ? N

SET PAPER TO TOP OF FORM AND HIT RETURN

SCHEDULE FOR SAMPLES FROM CONWR : 12:46 AUG 11, 1985
 INPUT DATA STORED IN FILE : CONWRSCH811124685
 NUMBER OF SAMPLES = 43

| DATE | S.NO. | AS | DATE | S.NO. | AS | DATE | S.NO. | AS | DATE | S.NO. | AS |
|----------|-------|-----------|-------|-----------|-------|-----------|-------|----|------|-------|----|
| 07/25/85 | 42 | D07/25/85 | 44 | A07/25/85 | 2711 | A07/25/85 | 3243 | A | | | |
| 07/25/85 | 3244 | A07/25/85 | 3245 | A07/25/85 | 3246 | E07/25/85 | 3247 | A | | | |
| 07/25/85 | 3248 | A07/25/85 | 3249 | A07/25/85 | 3250 | A07/25/85 | 3251 | E | | | |
| 07/25/85 | 3252 | E07/25/85 | 3253 | E07/25/85 | 3254 | A07/25/85 | 3255 | E | | | |
| 07/25/85 | 3256 | A07/25/85 | 3257 | A07/25/85 | 3258 | A07/25/85 | 3384 | A | | | |
| 07/25/85 | 3385 | A07/25/85 | 3386 | A07/25/85 | 3387 | A07/25/85 | 3388 | D | | | |
| 07/25/85 | 3389 | A07/25/85 | 3390 | D07/25/85 | 3391 | A07/25/85 | 9383 | A | | | |
| 07/25/85 | 9384 | A07/25/85 | 9394 | A07/25/85 | 9395 | A07/25/85 | 9396 | A | | | |
| 07/25/85 | 9397 | A07/25/85 | 19301 | A07/25/85 | 19302 | A07/25/85 | 19303 | A | | | |
| 07/25/85 | 19304 | A07/25/85 | 19305 | A07/25/85 | 19306 | A07/25/85 | 19307 | A | | | |
| 07/25/85 | 19308 | A07/25/85 | 19309 | A07/25/85 | 19310 | A | | | | | |

SCHEDULE FOR SAMPLES FROM CONWR : 12:46 AUG 11, 1985

| PURGEABL | ACID EXT | BASE/ NEUT | PEST/ PCBS | PCBS PCDD/F | TOC | TOH |
|----------|-------------|---------------|---------------|-------------|-------|-------|
| 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 44 | 44 | 44 | 44 | | 44 | 44 |
| 2711 | 2711 | 2711 | 2711 | | 2711 | 2711 |
| 3243 | 3243 | 3243 | 3243 | | 3243 | 3243 |
| 3244 | 3244 | 3244 | 3244 | | 3244 | 3244 |
| 3245 | 3245 | 3245 | 3245 | | 3245 | 3245 |
| 3247 | 3247 | 3247 | 3247 | | 3247 | 3247 |
| 3248 | 3248 | 3248 | 3248 | | 3248 | 3248 |
| 3249 | 3249 | 3249 | 3249 | | 3249 | 3249 |
| 3250 | 3250 | 3250 | 3250 | | 3250 | 3250 |
| 3254 | 3254 | 3254 | 3254 | | 3254 | 3254 |
| 3256 | 3256 | 3256 | 3256 | | 3256 | 3256 |
| 3257 | 3257 | 3257 | 3257 | | 3257 | 3257 |
| 3258 | 3258 | 3258 | 3258 | | 3258 | 3258 |
| 3384 | 3384 | 3384 | 3384 | | 3384 | 3384 |
| 3385 | 3385 | 3385 | 3385 | | 3385 | 3385 |
| 3386 | 3386 | 3386 | 3386 | | 3386 | 3386 |
| 3387 | 3387 | 3387 | 3387 | | 3387 | 3387 |
| 3388 | 3388 | 3388 | 3388 | 3388 | 3388 | 3388 |
| 3389 | 3389 | 3389 | 3389 | | 3389 | 3389 |
| 3390 | 3390 | 3390 | 3390 | 3390 | 3390 | 3390 |
| 3391 | 3391 | 3391 | 3391 | | 3391 | 3391 |
| 9383 | 9383 | 9383 | 9383 | | 9383 | 9383 |
| 9384 | 9384 | 9384 | 9384 | | 9384 | 9384 |
| 9394 | 9394 | 9394 | 9394 | | 9394 | 9394 |
| 9395 | 9395 | 9395 | 9395 | | 9395 | 9395 |
| 9396 | 9396 | 9396 | 9396 | | 9396 | 9396 |
| 9397 | 9397 | 9397 | 9397 | | 9397 | 9397 |
| 19301 | 19301 | 19301 | 19301 | | 19301 | 19301 |
| 19302 | 19302 | 19302 | 19302 | | 19302 | 19302 |
| 19303 | 19303 | 19303 | 19303 | | 19303 | 19303 |
| 19304 | 19304 | 19304 | 19304 | | 19304 | 19304 |
| 19305 | 19305 | 19305 | 19305 | | 19305 | 19305 |
| 19306 | 19306 | 19306 | 19306 | | 19306 | 19306 |
| 19307 | 19307 | 19307 | 19307 | | 19307 | 19307 |
| 19308 | 19308 | 19308 | 19308 | | 19308 | 19308 |
| 19309 | 19309 | 19309 | 19309 | | 19309 | 19309 |
| 19310 | 19310 | 19310 | 19310 | | 19310 | 19310 |

SCHEDULE FOR SAMPLES FROM CONWR : 12:46 AUG 11, 1985

| SP. COND | PH | METAL | HG | CN | N%-SER | TOT%-P | CE%-CAP | SDWS |
|----------|-------|-------|-------|-------|--------|--------|---------|------|
| 42 | 42 | | 42 | 42 | 42 | 42 | | |
| 44 | 44 | | 44 | 44 | 44 | 44 | | |
| 2711 | 2711 | | 2711 | 2711 | 2711 | 2711 | | |
| 3243 | 3243 | | 3243 | 3243 | 3243 | 3243 | | |
| 3244 | 3244 | | 3244 | 3244 | 3244 | 3244 | | |
| 3245 | 3245 | | 3245 | 3245 | 3245 | 3245 | | |
| | | | | | | | | 3246 |
| 3247 | 3247 | | 3247 | 3247 | 3247 | 3247 | | |
| 3248 | 3248 | | 3248 | 3248 | 3248 | 3248 | | |
| 3249 | 3249 | | 3249 | 3249 | 3249 | 3249 | | |
| 3250 | 3250 | | 3250 | 3250 | 3250 | 3250 | | |
| | | | | | | | | 3251 |
| | | | | | | | | 3252 |
| | | | | | | | | 3253 |
| 3254 | 3254 | | 3254 | 3254 | 3254 | 3254 | | |
| | | | | | | | | 3255 |
| 3256 | 3256 | | 3256 | 3256 | 3256 | 3256 | | |
| 3257 | 3257 | | 3257 | 3257 | 3257 | 3257 | | |
| 3258 | 3258 | | 3258 | 3258 | 3258 | 3258 | | |
| 3384 | 3384 | | 3384 | 3384 | 3384 | 3384 | | |
| 3385 | 3385 | | 3385 | 3385 | 3385 | 3385 | | |
| 3386 | 3386 | | 3386 | 3386 | 3386 | 3386 | | |
| 3387 | 3387 | | 3387 | 3387 | 3387 | 3387 | | |
| 3388 | 3388 | | 3388 | 3388 | 3388 | 3388 | | |
| 3389 | 3389 | | 3389 | 3389 | 3389 | 3389 | | |
| 3390 | 3390 | | 3390 | 3390 | 3390 | 3390 | | |
| 3391 | 3391 | | 3391 | 3391 | 3391 | 3391 | | |
| 9383 | 9383 | | 9383 | 9383 | 9383 | 9383 | | |
| 9384 | 9384 | | 9384 | 9384 | 9384 | 9384 | | |
| 9394 | 9394 | | 9394 | 9394 | 9394 | 9394 | | |
| 9395 | 9395 | | 9395 | 9395 | 9395 | 9395 | | |
| 9396 | 9396 | | 9396 | 9396 | 9396 | 9396 | | |
| 9397 | 9397 | | 9397 | 9397 | 9397 | 9397 | | |
| 19301 | 19301 | | 19301 | 19301 | 19301 | 19301 | | |
| 19302 | 19302 | | 19302 | 19302 | 19302 | 19302 | | |
| 19303 | 19303 | | 19303 | 19303 | 19303 | 19303 | | |
| 19304 | 19304 | | 19304 | 19304 | 19304 | 19304 | | |
| 19305 | 19305 | | 19305 | 19305 | 19305 | 19305 | | |
| 19306 | 19306 | | 19306 | 19306 | 19306 | 19306 | | |
| 19307 | 19307 | | 19307 | 19307 | 19307 | 19307 | | |
| 19308 | 19308 | | 19308 | 19308 | 19308 | 19308 | | |
| 19309 | 19309 | | 19309 | 19309 | 19309 | 19309 | | |
| 19310 | 19310 | | 19310 | 19310 | 19310 | 19310 | | |

CONWRAIAL1113212705

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

REPORT: NOV 13, 1985

NUMBER OF ANALYSES COMPLETED

| PARAMETERS | HOLL-AREA 9 | | | | AREA 9 | | | | DUPLICATES/SPIKES | | | | CUMUL. TOTAL |
|--------------------------|-------------|-------|----------|-------|--------|-------|----------|-------|-------------------|-------|----------|-------|--------------|
| | SOIL | WATER | SEDIMENT | TOTAL | SOIL | WATER | SEDIMENT | TOTAL | SOIL | WATER | SEDIMENT | TOTAL | |
| 1-FURGEABLES-SCREEN | 82 | 5 | 29 | 116 | 0 | 0 | 18 | 18 | 15 | 1 | 7 | 23 | 157 |
| 2-ACID. EXTRACT, -SCREEN | 71 | 19 | 29 | 119 | 0 | 0 | 9 | 9 | 15 | 1 | 4 | 20 | 140 |
| 3-BASE/NEUTRALS-SCREEN | 71 | 19 | 29 | 119 | 0 | 0 | 9 | 9 | 15 | 1 | 4 | 20 | 140 |
| 4-PESTICIDES-SCREEN | 0 | 15 | 1 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| 5-PCPS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6-METALS-ICAFS | 82 | 20 | 29 | 131 | 0 | 0 | 18 | 18 | 28 | 3 | 13 | 44 | 193 |
| 7-METALS-AA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8-MERCURY | 80 | 21 | 29 | 130 | 9 | 0 | 18 | 27 | 15 | 1 | 7 | 23 | 180 |
| 9-CYANIDE | 40 | 20 | 27 | 87 | 0 | 0 | 0 | 0 | 7 | 1 | 1 | 9 | 96 |
| 10-PH | 80 | 14 | 30 | 124 | 36 | 0 | 18 | 54 | 15 | 0 | 7 | 22 | 200 |
| 11-SP, COND. | 82 | 14 | 30 | 126 | 37 | 0 | 18 | 55 | 19 | 0 | 7 | 26 | 207 |
| 12-TOC | 82 | 21 | 30 | 133 | 36 | 0 | 18 | 54 | 20 | 1 | 7 | 28 | 215 |
| 13-TOH | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 17 |
| 14-EXPLOSIVES | 82 | 20 | 29 | 131 | 4 | 0 | 18 | 22 | 30 | 4 | 12 | 46 | 197 |
| 15-NITROGEN SERIES | 82 | 21 | 30 | 133 | 35 | 0 | 18 | 53 | 20 | 1 | 7 | 28 | 214 |
| 16-PCDD/PCDF-SCREEN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-CATION EXCH, CAP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-TOT, PHOSPHORUS | 73 | 21 | 30 | 124 | 9 | 0 | 18 | 27 | 14 | 1 | 6 | 21 | 172 |
| 19-SDMA PARAMETERS | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 20-PERCENT TOT, SOLID | 81 | 0 | 29 | 110 | 37 | 0 | 17 | 54 | 20 | 0 | 5 | 25 | 187 |
| TOTAL ANALYSIS | 988 | 251 | 381 | 1620 | 203 | 0 | 197 | 400 | 233 | 16 | 87 | 336 | 2356 |

ATTACHMENT S-6F

ATTACHMENT S-7
REVIEW OF AVAILABLE INFORMATION
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
SANGAMO-WESTON, INC.

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REVIEW OF AVAILABLE INFORMATION
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

March 1985

O'Brien & Gere Engineers, Inc.

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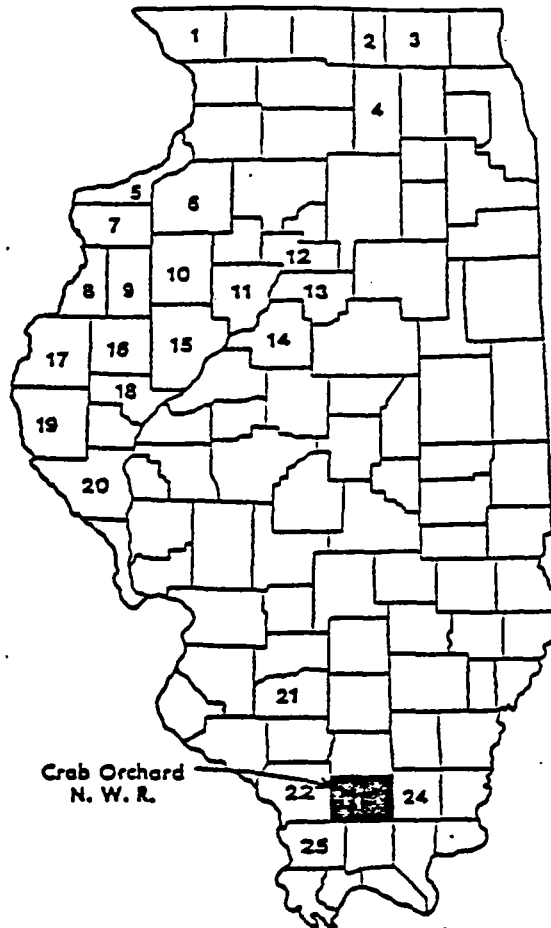
1. INTRODUCTION

A Scope of Work for a Remedial Investigation/Feasibility Study was developed by the U.S. Fish and Wildlife Service regarding the Crab Orchard National Wildlife Refuge in southern Illinois. The proposed study may be visualized as comprising six geographic elements: 1) Area-9 Landfill, 2) Plant Site (Building Complex), 3) Lake Inlet, adjacent to Area-9, 4) Remainder of Crab Orchard Lake, 5) Water Tower Dump, and 6) Fire Station Dump.

A review of previous data from reports, letters and memos (listed in the Appendix) was conducted. Available documents are listed in the Appendix. There are several documents, including some listed in the Reference Section of the RI/FS scope of work that were not available at the time of this review. These documents should be reviewed prior to developing a final scope of work.

This Review provides a concise overview, in the form of a one-page figure and/or summary, of available information on the various elements of this study.

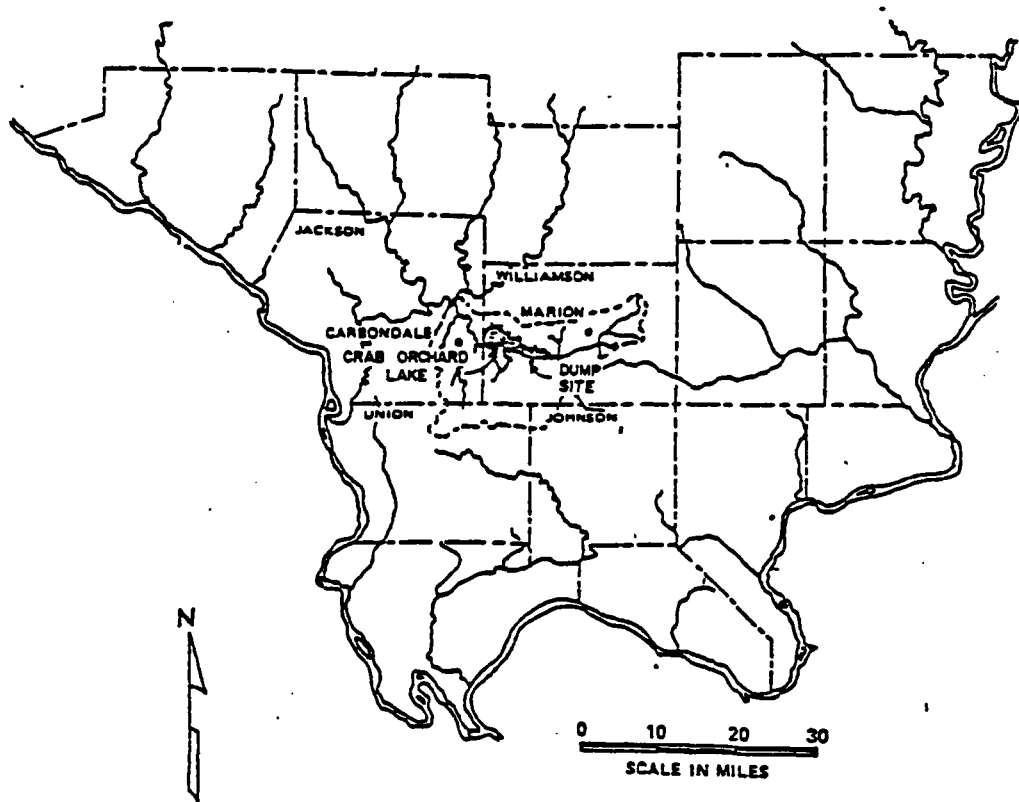
2. LOCATION
STATE OF ILLINOIS



Location of Crab Orchard National Wildlife Refuge

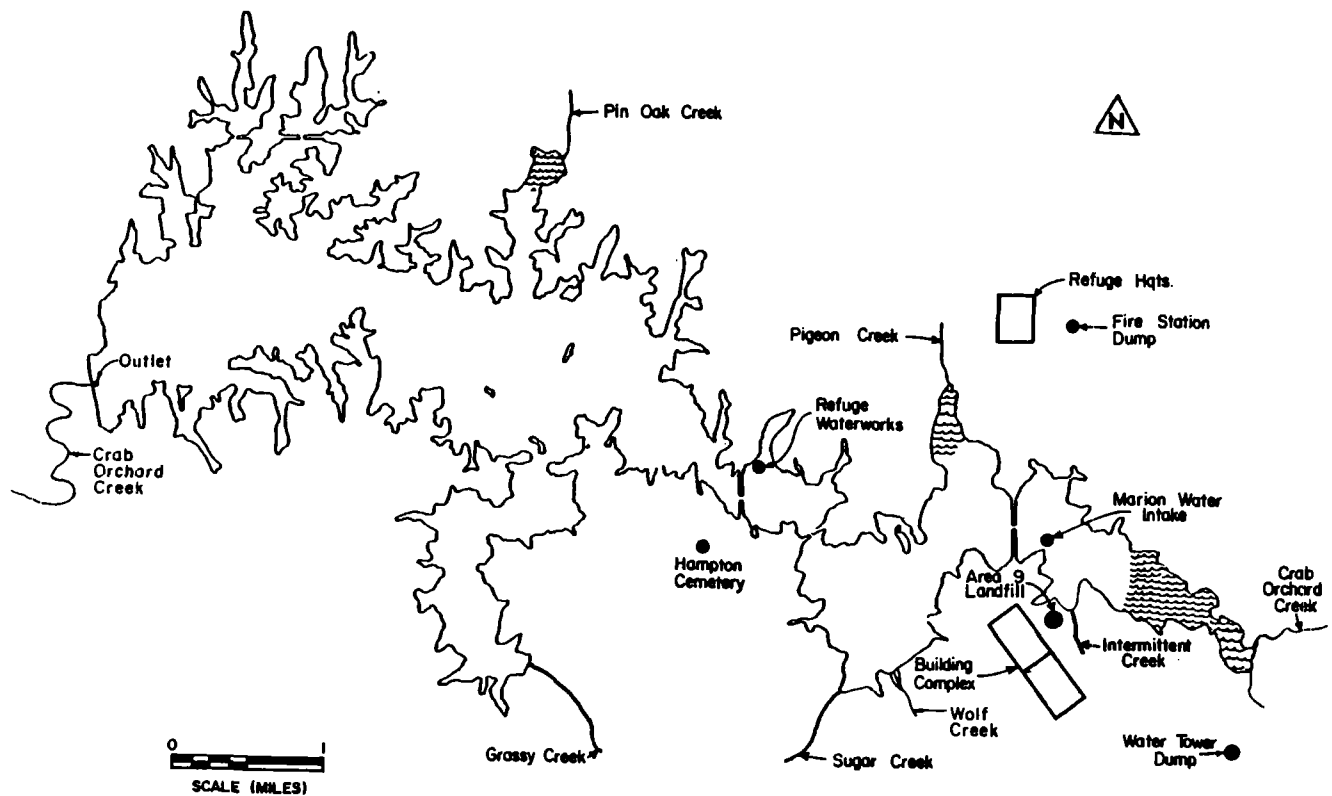
The Crab Orchard National Wildlife Refuge (C.O.NWR) is located in the southern region of the State of Illinois.

3. CRAB ORCHARD CREEK BASIN



The Crab Orchard National Wildlife Refuge (C.O.NWR) lies primarily within Williamson County and extends into neighboring Jackson, Union and Johnson Counties. There are twelve lakes, including the Crab Orchard Lake, located within the C.O.NWR.

4. CRAB ORCHARD LAKE



Crab Orchard Lake has a surface area of 6965 acres, a maximum depth of 30 feet, and 635 acre-feet of storage capacity. The watershed drainage area is 109,261 acres. The lake has a retention time of approximately 0.8 years. Water enters the lake through several creeks, including Crab Orchard Creek on the eastern end of the lake and an intermittent creek adjacent to the Area-9 Landfill. Water leaves the lake through Crab Orchard Creek on the western end of the lake. In addition, 280,000 gallons/day of water is used by the Refuge.

The Remedial Investigation/Feasibility Study Scope of Work covers the eastern portion of the Crab Orchard Lake, the Area-9 Landfill, the Building Complex, Water Tower dump and the Fire Station dump.

5. SITE HISTORY

The land which now is within the Crab Orchard National Wildlife Refuge has supported several different uses over the past fifty years. The history of the area is important, because definition of the present contamination problem begins with information about past activities.

In the 1920s and 1930s, the present Crab Orchard National Wildlife Refuge was apparently used for agriculture (Ref 1). It was during that time that the United States began purchasing land in order to create a refuge (Ref 1).

The Illinois EPA reports that in 1940, the impoundment now called Crab Orchard Lake was completed (Ref 44).

The early 1940s were a time of national emergency. With the cooperation of the United States, industries established operations on the Crab Orchard site. Although the United States owned the land, it is unclear which agency was responsible for the administration of the property. From available information, it appears that title was held by the Department of the Interior, but the War Assets Administration may have had decision-making authority over the site (Ref 23).

In the early 1940s, according to former Sangamo employees, a number of industries were active on the Crab Orchard site:

- Sherwyn Williams built a facility and manufactured land mines and bombs. Sherwyn Williams operated its facility under contract with the United States (Ref 1).
- National Radiator located on the site (Ref 1).
- Dynagraph (?) Bradley located on the site; it manufactured printing inks (Ref 1).
- Two transformer companies used the site; one was Kenyon, located near the Fire Station dump. The name of the other company is not known (Ref 1).
- A nearby plant made radio speakers (Ref 1).
- Nearby plants were engaged in metal plating, painting, metal work and electrical work (Ref 1).
- An ammunition plant was operated on the site (Ref 47).

To support the industries, industrial landfills were developed (Ref 37).

There was an explosion and fire at the Crab Orchard site. The U.S. EPA stated that some of the buildings that were involved were lined with lead (Ref 47).

During the early 1940s, too, the Crab Orchard site was repeatedly sprayed with lead arsenate to control insects (Ref 47).

5. SITE HISTORY (cont.)

In 1946, Sangamo Electric Company began manufacturing at the site (Refs 23, 52). The contract between the United States and Sangamo was probably negotiated with the War Assets Administration (Ref 23). Sangamo, during its tenure on the site, manufactured transformers, capacitors, and various other electrical products (Ref 1). The Ordill facility, as it was known, contained the Sangamo Capacitor Division. That division manufactured power factor capacitors, AC motor run capacitors, and a variety of DC capacitors. The components were of various types and included aluminum, electrolytes, mica, and silver and lead foil. The Division also manufactured small transformers that used mineral oil as a dielectric. Former Sangamo employees have indicated that the principal dielectrics used for the capacitors were Aroclors 1254 and 1242 (Ref 1).

After Sangamo was established, but still during 1946, the Crab Orchard site was turned over to the U.S. Fish and Wildlife Service (Ref 47). At the government's direction, Sangamo disposed of certain industrial wastes at a landfill owned by the government. The landfill is northeast of the former Sangamo plant site.

Between 1946 and 1961, Sangamo operated on the Crab Orchard site. It is not clear when Olin Corporation started using industrial facilities at the site from the references available, but Olin manufactured explosives that were used to start jet engines (Ref 1). The company used nitroglycerine in its operation. Also during part of this time, although exact dates are not available from the references used, a vocational college associated with Southern Illinois University used part of the site (Ref 1).

In 1952 or 1953, the original capacitor plant of Sangamo burned. Former Sangamo employees said that the plant burned just before it was scheduled to open (Ref 1). It is unclear, then, whether Sangamo produced capacitors before the early 1950s. The capacitor plant was rebuilt in 1952 or 1953 (Ref 1).

In 1953 or 1954, Olin experienced a massive explosion at its nitroglycerine operation (Ref 1).

In 1962, Sangamo closed its capacitor manufacturing plant at the Crab Orchard site (Ref 52).

From 1962 on, a number of other manufacturers moved to the site:

- Tuck Tape moved into a Sangamo building. Tuck Tape had a fire in the same year (Ref 1).
- Hoozier Cardinal used the site to manufacture automobile parts (Ref 1).
- Corrugated boxes were manufactured at the site (Ref 1).
- Fiberglass boats were manufactured at the site (Ref 1).
- Universal Match operated at the Crab Orchard Refuge.

5. SITE HISTORY

(cont.)

The landfill used by Sangamo may have been closed by the U.S. Fish and Wildlife Service in 1964 (Ref 48). The wastes were covered with soil. According to the Illinois EPA the cover has eroded in places (Ref 48). The U.S. EPA has reported that, between 1973 and 1983, the U.S. Fish and Wildlife Service removed and disposed of five (5) million pounds of explosives and other refuse from the Crab Orchard site (Ref 47), not limited to the Area 9 Landfill.

From the late 1970s through the present, sampling has been conducted to permit analysis of possible contamination at the Refuge. Until 1981, the main parameters of interest were lead, mercury, and other heavy metals, notably cadmium. After 1981, analyses were conducted also for PCBs, dioxins, and benzo furans (Multiple References).

On 16 May 1984, the Illinois Environmental Protection Agency sealed the Area 9 Landfill stating:

The Agency has determined that the (U.S.) Department (of the Interior) has, through its contract relationship with the former tenant of the Sangamo site, Sangamo Electric Company, deposited... contaminants upon the land in such place and manner so as to create a water pollution hazard.

The Agency has determined that the Department has caused or allowed the open dumping of waste containing the aforementioned contaminants in violation of Section 21 (a) of the (Illinois Environmental Protection) Act, and continues to allow such contaminated waste to be stored or disposed of in violation of Section 12(e) and (f) of the Act and the Resource Conservation and Recovery Act of 1976.(Ref 24)

In July 1984, the U.S. Fish and Wildlife Service circulated a draft scope of work for a Remedial Investigation/Feasibility Study applicable to the Crab Orchard site (Ref 13).

Also in July 1984, Olin restricted access to Building I-1-23 because of high levels of PCBs. Olin leased the building from the U.S. Fish and Wildlife Service. The building formerly had been occupied by Sangamo Electric (Ref 12).

6. SITE HYDROGEOLOGY

On-site land surface elevations range between 410 and 420 feet above mean sea level (msl). The spillway elevation of the lake is at 405 feet msl. The topography in the vicinity of the site slopes gently northward towards the lake.

Available boring logs indicate that the site is underlain by a minimum of 7.5 feet of silty clay. The logs of observation wells (Ref 27) installed around the landfill (COW 1, COW 2 and COW 3) reveal that this silty clay layer is upwards of 30 feet thick north of the site and 25 feet thick to the south of the site. Additionally, the drilling log of the observation well south of the site (COW 1) reveals a silty sand layer from 25 feet to 30.5 feet below the surface. Thin lenses of silt and sand were reported below 14 feet in the other two observation well logs.

Four (4) test borings were drilled within the landfill by Ecology & Environment to determine the thickness of fill and the nature of the subsurface materials underlying the refuse. These borings reportedly revealed that the site consists of a thin layer of loess overlying 4 to 8 feet of fill. It was, however, reported that the actual boundary between the fill and the natural silty clays was difficult to determine due to weathering and leaching processes occurring during the twenty (20) years since the site was abandoned.

Groundwater was reportedly encountered at 24 feet in COW 1, 15 feet in COW 2 and 16 feet in COW 3 during drilling operations. However, groundwater measurements collected by Ecology & Environment on December 8, 1983, subsequent to well installation, show the groundwater to be between 2 and 6 feet below ground level. These groundwater elevation data indicate the silty clay may be saturated throughout.

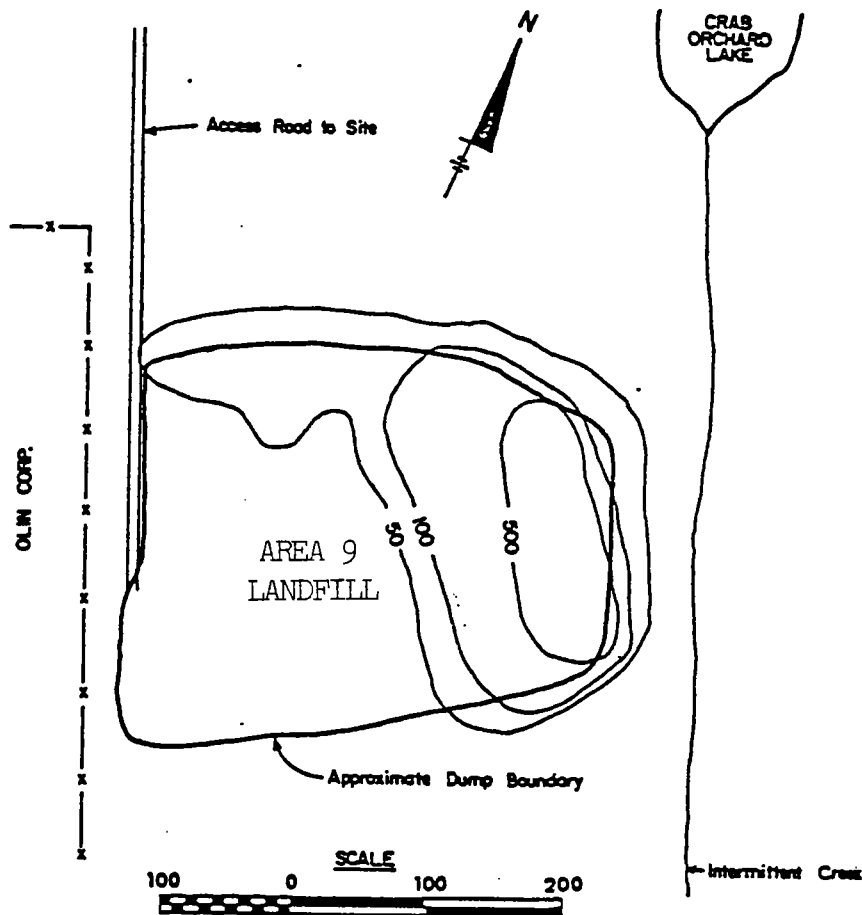
Although existing data is inadequate to fully characterize the shallow groundwater, flow within the silty clay material is likely toward Crab Orchard Lake. The lake also appears to serve as a shallow groundwater discharge point.

Projection of the groundwater elevations observed in monitor wells adjacent to the fill area suggest the base of the fill may be involved in the groundwater. Insufficient data exist to confirm whether the fill is unsaturated though.

In general, the on-site hydrogeology at the Area-9 Landfill has not been fully characterized. Additional study efforts that should be considered include:

1. Re-evaluation of on-site groundwater flow direction and chemistry.
2. In-situ hydraulic conductivity tests to assess groundwater flow velocity.
3. Additional groundwater monitor wells if Item 1 above suggests inadequacies in the existing monitoring network.

7. PHYSICAL INFORMATION - LANDFILLS



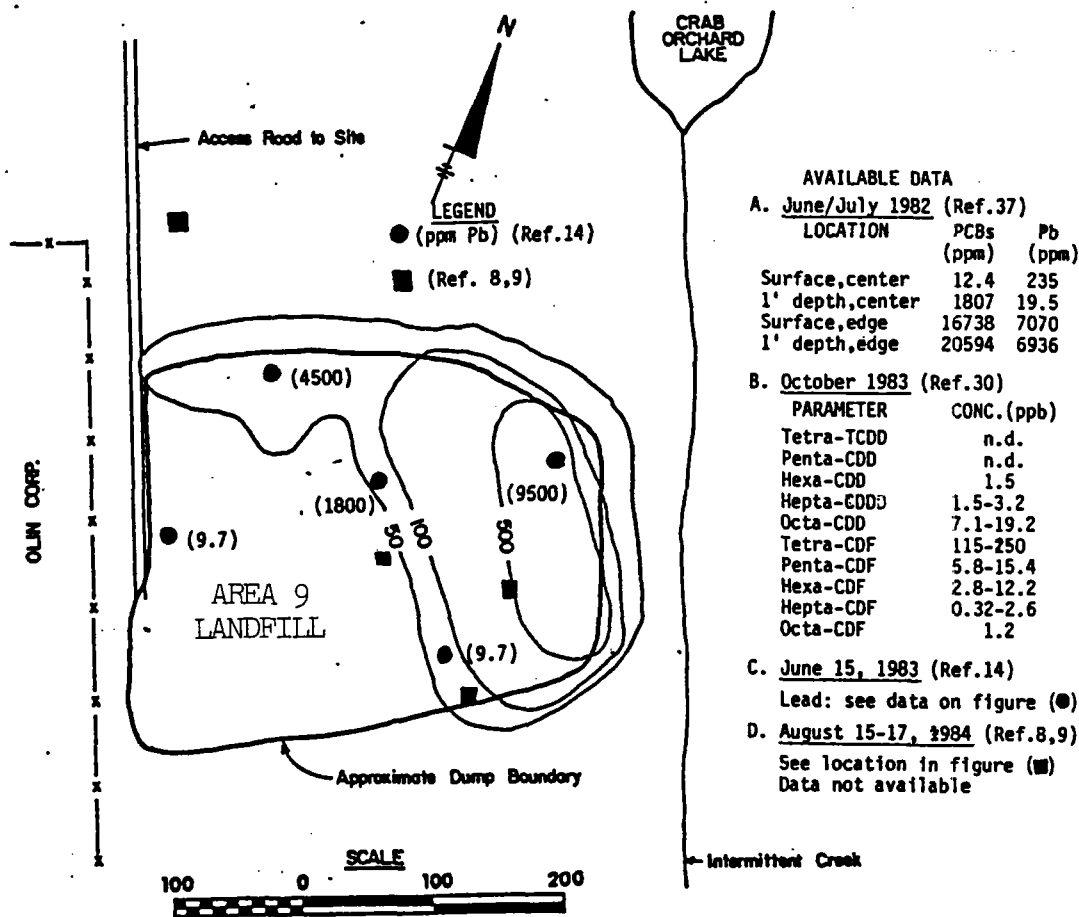
The Area-9 Landfill is located below the eastern section of Crab Orchard Lake and between the building complex and an intermittent creek. The limits of the landfill are discernable by changes in the topography and vegetation (Ref 47), revealing an area of approximately 2.5 acres with a fill thickness of 8 to 10 feet in the middle and 6 feet at the edges (Ref 31). The landfill is covered by a thick growth of tall grass, except where waste materials are exposed. Aerial photographs taken in August 1983 (Ref 47) and December 1984 have not been obtained yet.

The estimated volume is 16,000 cubic yards according to one report (Ref 48) and 35,000 cubic yards according to another report (Ref 29). Materials visible at the surface appear to be small capacitors, capacitor parts, large chunks of a golden resin, and a large number of 3-inch steel cuplike pieces. The latter are probably not attributable to the Sangamo operation (Ref 47) since they were found at other sites as well.

Waste oil and debris were burned, compacted in a swale and covered. Specific compounds of concern include lead, acetate, PCBs (Aroclor 1254 and 1242), and PCB burning products. Other possible materials from capacitor manufacturing include (Ref 1) mica, silver, cyanide, aluminum hydroxide, aluminum oxide, gold, copper, zinc, hydrochloric acid, styrene, nitric acid, phosphoric acid, and borates. Materials from other companies may include cyanides, printing inks and lead-based explosives. The results of a magnetometer survey (Ref 31) indicate a high concentration of metals on the eastern side of the landfill.

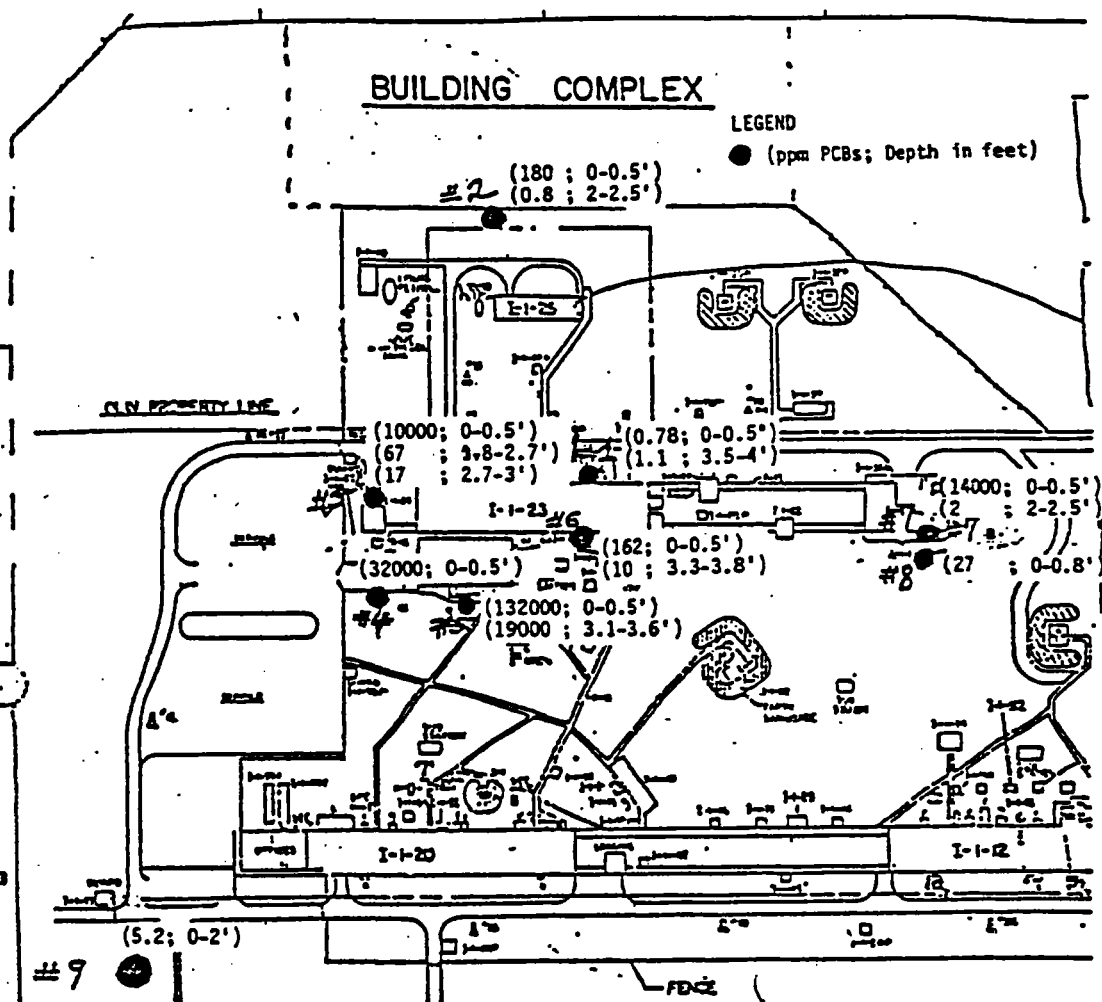
Information on the physical characteristics of the Fire Station landfill and Water Tower landfill has yet to be determined.

8. AREA-9 LANDFILL SAMPLING & ANALYSIS



- A. In June/July 1982 (Ref 37), surface and 1-foot deep samples from the center and eastern edge of the landfill were analyzed for PCBs (Aroclor 1254 and 1252) and lead (Pb). The data, shown above, indicate highest PCB and Pb concentrations along the edge of the landfill.
- B. In August 1983, samples were analyzed for six isomers of chloro-dibenzo-p-dioxins (CDDs) and chloro-dibenzo furans (CDFs) at the parts/billion (ppb) level by the University of Nebraska. Tetra- and penta-CDDs were not detected (see data above). The detection of hexa-, hepta- and octa-CDDs suggests the use of penta-chlorophenol, while the residues of dibenzo furans are likely from PCBs (Ref 32). In order to obtain more information on the distribution of PCDDs and PCDFs, a parts/trillion (ppt) detection level is suggested by Dr. D. Stalling (Ref 32).
- C. On June 15, 1983, soil samples at 0.5 to 1-foot deep from the center and four corners (NE, SE, SW AND NW) were analyzed for metals. Lead (Pb), barium (Ba), copper (Cu), and Zinc (Zn) concentrations were excessive compared to average Illinois levels. Barium was 47 to 3200 ppm, copper was 7 to 3300 ppm and zinc was 25 to 1000 ppm.
- D. Four core samples at soil surface and 2 to 3.5-feet deep (see locations in figure) were collected on August 15 - 17, 1984 for PCBs and metals analysis. Data are not available.

9. BUILDING COMPLEX - SAMPLING & ANALYSIS



Several soil samples at depths ranging from 0 to 4 feet were collected on July 2 - 3, 1984 by Olin Corporation from areas near Building I-1-23 for PCB analysis (Ref 12). The building was leased from USFWS and was formerly occupied by Sangamo Weston. High concentrations of PCBs (10,000 to 132,000 ppm) are observed in the immediate vicinity of Building I-1-23 and in the ditches. This may be attributed to spills that were treated with an adsorbant, which was then swept out the door (Ref 1). PCBs in samples from depths of 1.8 to 4 feet ranged from 0.6 to 67 ppm, except one sample (#5), which contained 19,000 ppm PCBs.

10. WATER TOWER AND FIRE STATION DUMPS AND OTHER AREAS

SAMPLING & ANALYSIS

A review of the available information suggests that several other areas, including the Water Tower (WT) dump, Fire Station (FS) dump, Hampton Cemetery (HC) dump, U.S. Powder, Carterville Hunting area and Old Job Corps area, may be sources of contamination.

The above-mentioned sites were tested in June/July 1982 (Ref 41) for lead. The Fire Station, Water Tower and Hampton Cemetery dumps showed elevated levels of lead as given below, while the other sites had lead levels similar to controls (13 - 35 ppm). Carterville Hunting Area and Area-13 have elevated levels of arsenic (4.8 - 23 and 6.1 - 15 ppm, respectively).

| <u>Samples</u> | <u>Pb (ppm)</u> | | |
|------------------|-----------------|-------------|-------------|
| | <u>F.S.</u> | <u>W.T.</u> | <u>H.C.</u> |
| Surface, center | 108 | 86.3 | 151 |
| 1' depth, center | 553 | 843 | 11.5 |
| Surface, edge | 70.5 | 52.3 | 20.4 |
| 1' depth, edge | 141 | 19.8 | 30.3 |

On June 15, 1983 (Ref 21), surface and 1-foot deep samples from the WT dump, HC dump, U.S. Powder and Area-10 were analyzed for PCBs and metals. PCBs were not detected in the HC dump, while low levels of PCBs were measured in Area-10 (0.07 - 0.24 ppm) and the WT dump (<0.05 - 0.15 ppm). U.S. Powder had higher levels (<0.05 - 2.5 ppm) of PCBs. Heavy metals, including lead and zinc, in soils from WT, HC and Area-10 dumps were within southern Illinois background, and U.S. Powder soils had lead concentrations of 11 to 130 ppm.

Three samples from Area-11 refuse collected September 18, 1984 (Ref 45) had no detectable PCBs or chlorinated pesticides, but appeared to contain some polysulfones.

The limited data on the WT dump, FS dump and other areas suggest that PCBs, lead, zinc and arsenic may be found elsewhere on the C.O.NWR dump sites. Additional data on these sites should be obtained to further assess the extent and cause of contamination.

11. CRAB ORCHARD LAKE WATER

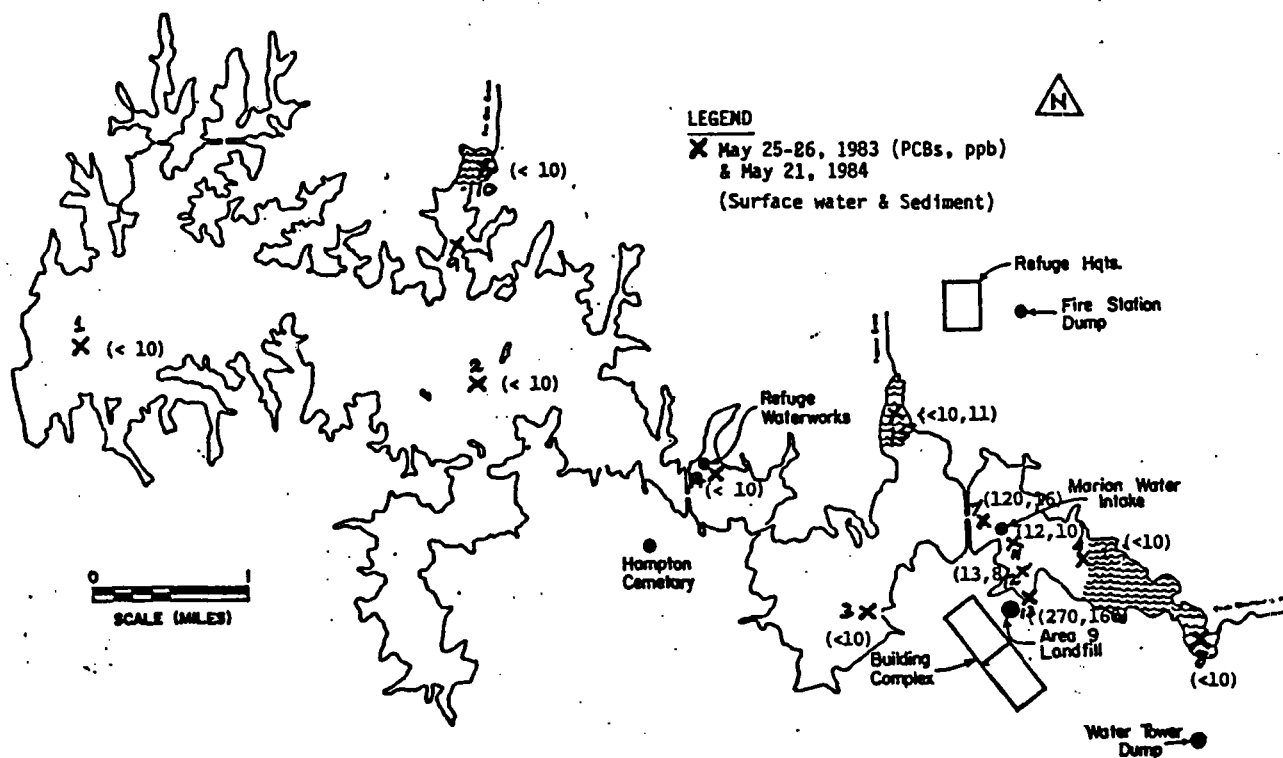
SAMPLING & ANALYSIS

On May 25 - 26, 1983 (Ref 25), fourteen (14) water samples from Crab Orchard Lake (see following page for locations) were analyzed for PCBs, chlorinated pesticides and metals. PCBs (<0.1 ppb), chlorodane (<0.01 ppb), DDT, endrin, mettioxychlor, BHC, hexachlorobenzene and aldrin (<0.02 ppb) were all less than the ppb detection levels, although the presence of dieldrin and chlordanes were indicated. While lead (<50 ppb), cadmium (<3 ppb), chromium, copper and cobalt (<5 ppb) were below ppb detection levels, barium and zinc concentrations ranged from 31 to 54 and less than 50 to 101 ppb, respectively.

On May 21, 1984 (Ref 25), supplemental samples (see following page for locations) were analyzed for the same parameters as above. Although the presence of PCBs, dieldrin, chlordanes and pentachlorophenol was indicated, the concentration of all these organics were below ppb detection levels, except at location #13 which contained 0.16 ppb PCBs, and at #3 and #10 where 0.018 and 0.011 ppb pentachlorophenol, respectively, were measured.

Of the fourteen (14) sampling locations, five (5) were near the Area-9 Landfill, while the others covered various regions of the lake. The results of the two sampling programs suggest that the lake water is not seriously contaminated.

12. CRAB ORCHARD LAKE SEDIMENTS - SAMPLING & ANALYSIS



In the summer of 1979 (Ref 43), sediments from lakes in Illinois were analyzed for metals, PCBs, dieldrin, heptachlorepoxyde and DDT. The concentration of metals in Crab Orchard Lake sediments were well within the range of values for all lakes in Illinois, and in most cases below the state-wide averages. PCBs, dieldrin, heptachlorepoxyde and DDT were below detection levels (<10, <1, <1 and <5 ppb, respectively) in Crab Orchard Lake sediments.

Analysis of Crab Orchard Lake sediments from fourteen locations (shown above) on May 25 - 26, 1983 (Ref 25) indicated less than 10 to 270 ppb PCBs in the region above the Area-9 Landfill, while at other locations, PCBs were less than the detection level of 10 ppb. Dieldrin, chlordane, DDT and pentachlorophenol were below the corresponding detection levels of 1, 5, 10 and 1 ppb, respectively.

A June 15, 1983 U.S. Fish and Wildlife (USFWS) sampling program showed 0.41 and 0.76 ppm PCBs in Crab Orchard Lake sediments in the bay region off the Area-9 Landfill, while PCBs in three sediments from mid-lake, north of the Landfill, were below 0.05 ppm.

Five sediment samples, collected June 21, 1984 (Refs 10, 11), had 2,3,7,8 TCDD, total tetra-CDD, penta-CDD and hexa-CDD below the ppt detection levels. Hepta-CDD and octa-CDD, which are considerably less toxic than 2,3,7,8 TCDD, were at concentrations ranging from 160 to 1400 and 3400 to 12,000 ppt, respectively. Among the dibenzo furans, only 2,3,7,8 Tetra-CDF was found (210 to 50 ppt). At these concentrations in sediments, these compounds are not expected to pose any problems.

13. CRAB ORCHARD LAKE FISH

SAMPLING & ANALYSIS

A significant amount of data is available on several species of fish in Crab Orchard Lake. The species include largemouth bass, channel catfish, blue gill, white crappie, bullhead and carp. The fish samples collected at several locations in the lake had contaminant concentrations, when detectable, that were well below the FDA limits.

Mercury levels in fish sampled in the summer of 1976 ranged from 0.13 to 0.46 ppm. Mercury levels were lower (<0.05 to 0.39 ppm) in samples collected in September 1982 (Ref 38).

May 15, 1981 results (Ref 46) from fifteen (15) fish samples revealed no mercury, dieldrin, DDT, heptachlor, or PCB contamination in fish.

In September 1982, thirteen (13) channel catfish and fourteen (14) largemouth bass were analyzed for lead and PCBs. Only one channel catfish had 0.14 ppm lead, while all others were less than detectable (<0.1 ppm lead). PCBs in channel catfish ranged from less than 0.2 to 5.2 ppm, and in largemouth bass from 0.84 to 9.3 ppm.

In March 1983 (Ref 35, 53), six (6) species of fish were sampled by the Illinois DOC for PCBs. The concentrations in the edible portions of largemouth bass samples ranged from 0.12 to 0.34 ppm PCBs; in two (2) channel catfish, 0.34 and 1.1 ppm PCBs; while carp had less than 0.01 to 0.02 ppm PCBs. No PCBs were detected in five (5) bluegill, five (5) white crappie and two (2) bullhead samples. These values are well within the previous FDA limit of 5 ppm PCBs and the current FDA limit of 2 ppm.

Fifteen (15) fish samples collected on April 16, 1984 and May 18, 1984 (Ref 21) were well below the FDA limits of 0.5 ppm for mercury (<0.01 to 0.36 ppm), 0.3 ppm for dieldrin (<0.01 to 0.12), 0.3 ppm for heptachlor (<0.01 to 0.16), 5 ppm for DDT (<0.01 ppm), and 2 ppm for PCBs (<0.1 to 1.1 ppm).

Analysis of four (4) largemouth bass, three (3) channel catfish, and three (3) carp samples on June 21, 1984 indicated that the six isomers of dioxins were below ppt detection levels. Tetra-CDF, which is significantly less toxic than 2,3,7,8 TCDD, ranged from 5.3 to 41 ppt. The other isomers of dibenzo furans were below detection levels.

15. SURFACE WATER/SEDIMENTS

SAMPLING & ANALYSIS

Limited data are available on surface water and creek sediments. In July 1982 (Ref 37), low levels of PCBs were found in sediments from five Crab Orchard Lake tributaries. PCB concentrations were 0.12 ppm in Crab Orchard Creek sediment, 0.09 ppm in Grassy Creek (located west of Area-9), 0.04 ppm in Wolf Creek (west of Area-9 Landfill), 0.38 ppm in Pin Oak Creek and 0.20 ppm in Pigeon Creek (west of Area-9 Landfill and north of the lake).

Surface sediments from an intermittent creek opposite the Area 9 Landfill had 44 ppm PCBs (dry weight), and 2.4 to 16 ppm PCBs close to the lake. Soil samples at a 1-foot depth in the intermittent creek opposite the Area 9 Landfill contained 4.4 ppm PCBs.

Water and sediment samples were collected on August 15, 1984 (Ref 8) from Crab Orchard Creek at two locations, one at Crab Orchard Lake and the other upstream of Marion. Data are not available at this time.

16. GROUNDWATER - SAMPLING ANALYSIS

There are few wells within three miles of the Area-9 Landfill that serve private residents or industries, and an estimated population of 75.

The only groundwater data available are from three monitoring wells installed around the Area-9 Landfill in August 1984 (Ref 27). Metals concentrations in well samples were as follows: aluminum 265 - 2330 ppb, iron 104 - 2440 ppb, lead less than 5 - 5.9 ppb, manganese less than 10 - 145 ppb, zinc 80 - 751 ppb, and tin less than 20 - 90 ppb. Of several organic compounds analyzed, PCBs were 1.3 - 3.3 ppb, dieldrin less than 1 ppb, heptachlor 0.005 ppb, chloroform less than 5 - 13 ppb, lindane 0.008 ppb, endosulfate 0.048 ppb, and 1,1,2,2-tetrachloroethane less than 1 ppb.

No original studies?

17. WATER SUPPLY SYSTEM

Refuge

Crab Orchard Lake is the primary water supply for the Refuge, which uses approximately 280,000 gpd (Ref 52). This includes usage by the penitentiary. The water intake is located approximately one mile from the Area 9 Landfill site. PCBs have not been detected in the lake water (Ref 50), as they are virtually insoluble. Quarterly samples collected from the U.S. Federal Penitentiary (Ref 13) during 1983 and 1984 had trihalomethanes in the range of 0.023 to 0.245 ppb.

Marion

The City of Marion draws water from a reservoir that has an auxiliary intake on the south shore of Crab Orchard Lake (Ref 2). This intake is approximately 1200 feet from the intermittent creek (Ref 52). Two sources stated that this intake is used in the late summer and fall, during periods of peak demand (Ref 17, 24, 50, 52). Another source stated that it has only been used once since 1967 (Ref 2). The reservoir is filling with sediments (Ref 1).

Analysis of the sediments reportedly showed 54 ppb PCBs (Ref 52), but this figure is disputed (Ref 2) since there are no analyses to verify it. PCBs have not been detected in the reservoir (Ref 50).

18. BIOLOGICAL SAMPLING

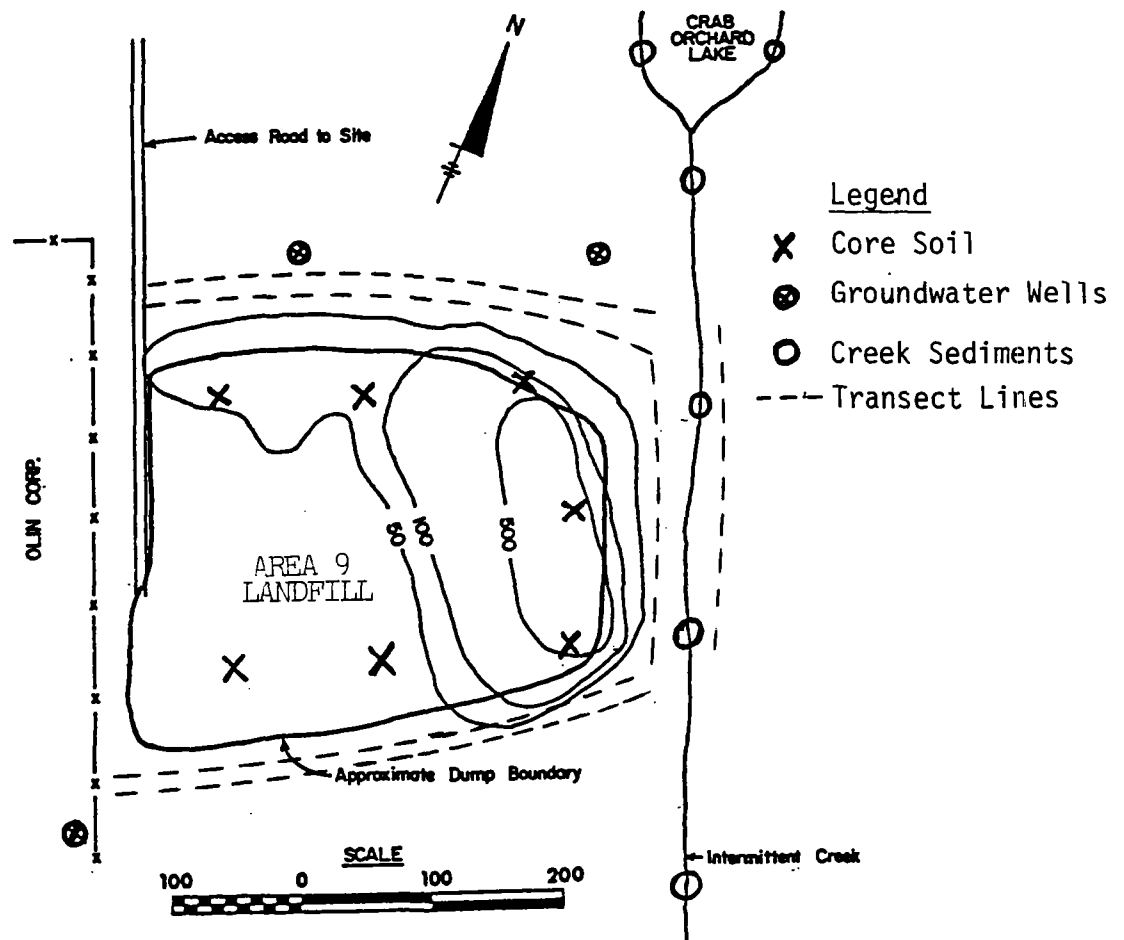
In 1979 and 1980 (Ref 42), biological water quality sampling programs were conducted to assess the extent of the impact of wastewater discharge from the Marion Wastewater Treatment Plant (WWTP) to Crab Orchard Creek. Sampling points were located on a 5.5 mile stretch from the WWTP to Crab Orchard Lake. Crab Orchard Creek has a drainage area of 82.6 square miles and has a 7-day, 10-year low flow of 0 cfs. According to the July 1981 Report by the Illinois EPA (Ref 42), Crab Orchard Creek remains adversely affected by discharge from the Marion WWTP, with high levels of ammonia, nitrogen and phosphorus, and low dissolved oxygen levels.

In July 1982, lead levels were measured in earthworms, honeysuckle roots and leaves, prairie vole liver, and white-footed mouse liver. The highest lead levels (1.73 and 4.19 ppm) were detected in earthworms from the Fire Station dumps. Earthworms at the Area-9 Landfill, Water Tower dump and U.S. Powder contained less than 0.6, 0.49, less than 0.2 and 0.52 ppm lead, respectively. Honeysuckle roots and leaves had lead levels less than 0.46 ppm, except for one root sample from the Area-9 Landfill, which contained 81.6 ppm lead. Lead was less than 0.28 ppm in prairie vole livers and white-footed mouse livers at all the sampling sites.

19. RI/FS SAMPLING & ANALYSIS SUMMARY

| NO. | SAMPLE TYPE | NO. OF SITES | SAMPLES TOTAL PER SITE | NO. OF SAMPLES | PRE-REQUISITE FOR ANALYSIS | ANALYSIS |
|-----|-------------------------------------|-----------------|------------------------------|----------------------|-------------------------------|--|
| 1 | SOILS | | | | | |
| | A. Area 9 Landfill | | | | | |
| | 1. 3 layers | 5 | 3 | 27 | - | -PCBs, Dioxins, Furans |
| | 2. 1' intervals | 5 | 12 | 117 | | -Priority Pollutants, pH, IE Capacity |
| | 3. 1' intervals | 3 | 10 | 30 | | -Dioxins & Furans |
| | 4. transect lines | 3 | 2 | 6 | | -PCBs |
| | B. Intermittent Creek | 5 | 3 | 15 | PRPs detected in dump | -Priority Pollutants pH, IE Capacity |
| | C. Fire Station | | | | | |
| | 1. 1' intervals | ? | ? | ? | | -Priority Pollutants pH, IE Capacity |
| | 2. 3 layers | ? | 3 | ? | | -Priority Pollutants, pH, IE Capacity |
| | D. Water Tower Dump | | | | | |
| | 1. 1' interval | ? | ? | ? | PRPs detected in dump? | -Priority Pollutants, pH, IE Capacity |
| | 2. 3 layers | ? | 3 | ? | PRPs detected in dump | -Priority Pollutants |
| | E. Building Complex | | | | | |
| | 1. surface | 67 | 1 | 67 | - | -PCBs |
| | 2. middle, bottom | 67 | 2 | 134 | If detected in surface | -PCBs |
| 2 | LAKE SEDIMENTS | 9 | 1 | 9 | PRPs detected in dump | -Priority Pollutants, Volatile Organics |
| 3 | GROUNDWATER | | | | | |
| | 1. initial | 3 | 1 | 3 | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans |
| | 2. additional | ? | 1 | 3 | " | " |
| | 3. second quarter | 3+? | 1 | 3+? | " | " |
| 4 | FISH - LAKE (4 species, 8 ponds) | 4 | 32 | 128 | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans |
| 5 | TURTLES - LAKE | 4 | 1 | 4 | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans, PCBs, Chlorinated nCs |
| 6 | CRAYFISH - LAKE | 4 | 1 | 4 | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans |
| 7 | B-REX - DUMP | 2 | 1 | 2 | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans |
| 8 | CONTROL AREA | ? | ? | ? | PRPs detected in dump | -Priority Pollutants, Dioxins, Furans |

AREA-9 LANDFILL AND INTERMITTENT CREEK

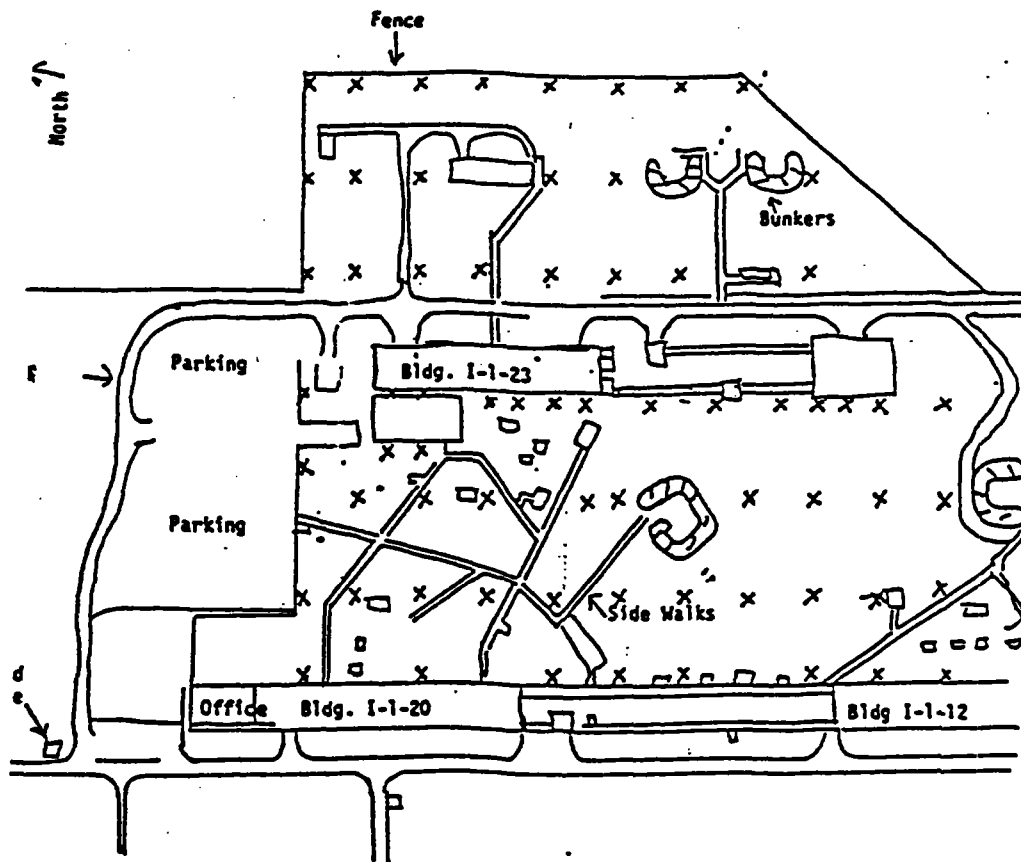


LANDFILL: Cores from depths of 0 to 12 feet to be sampled at nine (9) locations on the landfill.

INTERMITTENT CREEK: Six (6) sediment samples, one downstream of landfill, two adjacent to landfill and three (3) upstream by the lake.

GROUNDWATER: Three (3) existing wells and any additional wells, if necessary.

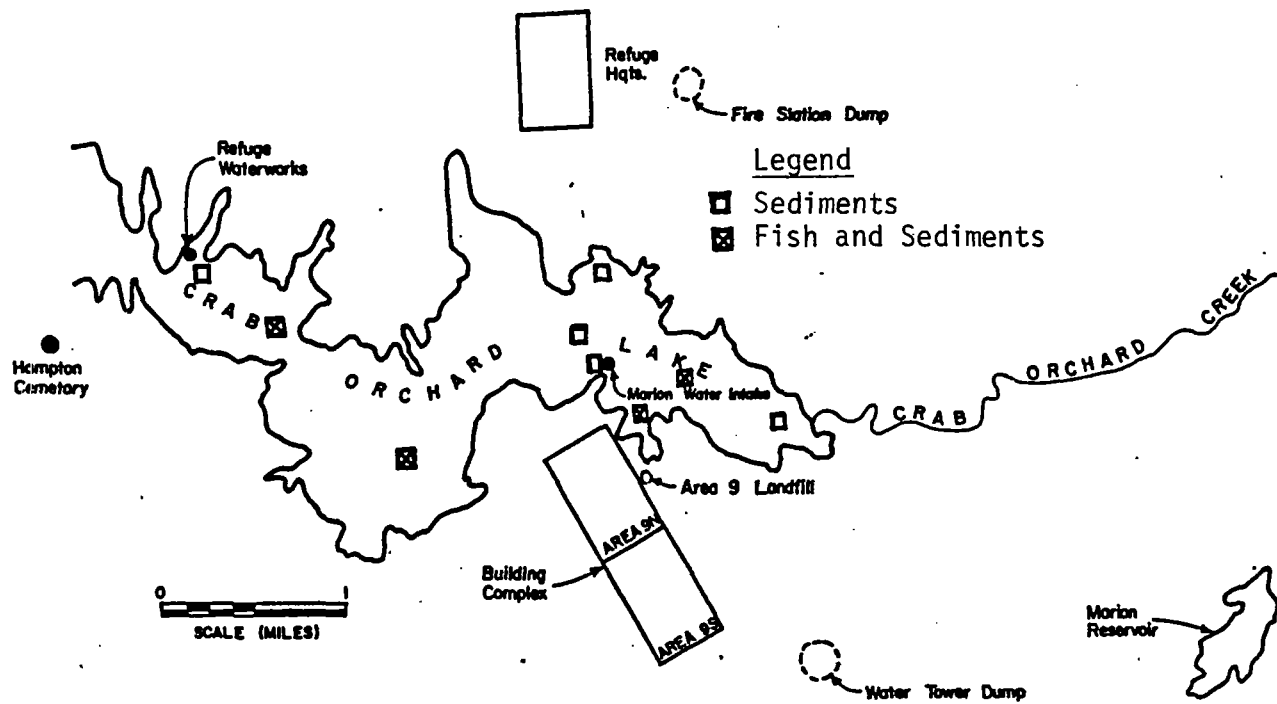
PLANT BUILDING COMPLEX



67 sites to be sampled at depths of 0 to 4 feet

EASTERN SECTION OF CRAB ORCHARD LAKE

SITE MAP



Lake sediments from nine (9) locations and fish samples from four (4) locations.

APPENDIX

SANGAMO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. | TYPE | DATE | TITLE | DESCRIPTION |
|------|------|---------------|--|---|
| 1 | L | Dec. 18, 1984 | From John Hanson to Dr. C.B. Murphy RE: Meeting with employees on 12-7-84 | Summary of meeting with present and former employees of the Capacitor Division on site history. |
| 2 | L | Dec. 14, 1984 | From John Hanson, Beveridge & Diamond to Russel H. Wyer, USEPA, Wash. D.C. RE: Amendment to Nat. Oil & Haz. Sub. Cont. Plans; The Nat. Prior. List; Proposed Rule | Comments on behalf of Sangamo Weston, Inc. re. the Haz. Ranking Score for the site. |
| 3 | L | Dec. 5, 1984 | From John W. Hanson to Christian Lisfert RE: List of information to be sought. | A four page list of information to be sought from Sangamo employees - including activities, nature of site, Olin Corporation. |
| 4 | X | Dec. 5, 1984 | From Paul Snorb to Sangamo File RE: Names of persons at Crab Orchard | A list of Government personnel, Olin personnel at C.D. facility and Govt. personnel in War Assets Admin., St. Louis |
| 5 | - | - | From DB&B to Beveridge & Diamond RE: List of Questions | A two page list of questions on Production and waste handling issues. |
| 6 | X | Oct. 22, 1984 | MEMO from Paul Snorb to Sangamo File Re: Maps of Crab Orchard Site | Maps of S. Illinois and Crab Orchard (C.D.) Lake, C.D. National Wildlife Refuge (NWR), Refuge & Drain Area, Dump magnetometer survey, Olin Plant Property, C.D. Creek Basin, Extended Site Map. |
| 7 | MS | Sen. 24, 1984 | MEMO from Dr. David Stalling, Columbia M. Fish. (CMFRU) to Dick Ruehl, Reg. III, RDA Specialist RE: QA/QC Assurance Statement for C.D. RFP | Procedures for Sampling and Analysis, and QA/QC. Specified detection levels: PCB - 0.1 ppt as Aroclor 1254 in tissue and soil; PCDDs & PCDFs - (=3.0 ppt in tissue & 100 ppt in soil for both 2,3,7,8-TCDD and 2,3,7,8-TCDF. Note: The above levels are 0.001 times lower than the values selected earlier, probably by Region III. |
| 45 | L | Sep. 18, 1984 | From Jim Hopkins, CDDI-FWS to Wayne Adams, COWAR RE: Results of C.D. Sample Analysis from Area 11 | Three samples, DD1, DD2 & DD3, analyzed. (No data attached) The three samples appear to contain polymeric siloxanes, with or without water. No PCBs or pesticides detected. |
| 45 | X | Aug. 31, 1984 | From Les Frankland, Ill. DOD to Matt Rice, FWS RE: Crab Orchard Lake Synopsis | A synopsis of Ill. DOD's involvement, primarily as a fish collection agency. |

SANGAMO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. | TYPE | DATE | TITLE | DESCRIPTION |
|------|------|---------------|--|---|
| | | | | Memorandum of Agreement for Fish Contaminant included. |
| 8 | X | Aug. 21, 1984 | From Wayne Adams, USDOJ to Dr. D. Stalling, CNFR. Re: Soil & water Samples - Sangamo, Marion | Transmittal memo for 9 water, sediment and soil samples numbered CR001 to CR009 collected on August 15 & 16, 1984. |
| 9 | X | Aug. 15, 1984 | From Michael O'Toole, USEPA, Chicago to File RE: Sampling effort at Dump Site on Aug. 15, 1984 | Effort to collect 4 composite core samples from Dump site. Transmitted to Dr. D. Stalling per Memo of 8/20/84. |
| 10 | X | Aug. 8, 1984 | From Charles R. Bell, USEPA, FOS-DPAWS, Springfield to Joseph E. Stuart, USEPA, FOS-DPAWS, Marion RE: Williamson Dnty - C.D. Refuge PWS; Fac. No. 1997037 | Results & news release by USEPA & USFWS on dioxin & furan analysis of fish & sediment samples at ppt detection levels. No 2,3,7,8-TCDD found in fish or sediments ((25 ppt safe) 2,3,7,8-TCDF at 5.3-41 ppt in fish ((5 ppt safe) hepta & octa dioxins at 150-12000 ppt in sediments (these are considerably less toxic than 2,3,7,8-TCDD) |
| 11 | L | Jul. 17, 1984 | From Michael O'Toole, USEPA, Chicago To Dr. D. Stalling, CNFR. RE: Transmittal of Fish & Sediment analysis | Results of Fish & Sediment analysis for Dioxins and Furans by California Analytical Laboratories, Inc. on Jun. 21, 1984. |
| 12 | X | Jul. 17, 1984 | From W. Adams, USDOJ to John Ellis, Twin Cities, MN RE: Clinic's Testing for PCBs in Plant Area | Results of analysis of soil samples from a few isolated areas near Bldg. 1-1-23 for PCBs. The Bldg. was leased from USFWS and was formerly occupied by Sangamo Electric. Analysis was conducted by ENVIRONDYNE ENGINEERS. Reported accuracy at 100 ppm (ug/kg). Total PCBs range from 0.095 to 132000 ppm. |
| 13 | X | Jul. 11, 1984 | From Dick Ruehle, USFWS to LIST RE: RI/FS Chap Orchard NAR | Draft RI/FS circulated for review by those on LIST. Basis for soil sampling & analysis for priority pollutants, tetra thru' octa series of dioxins & furans, pH & ion-exchange capacity. At 1 or 2 ft. intervals: soils analyzed starting at top, and contaminants not found at top not to be analyzed at next depth. DA/GC to be done by Dr. D. Stalling and Dr. Jim Petty. IDPA & FDA to send details on Fish. |
| 49 | X | Jul. 2, 1984 | From Gerald Unzicker to John Ellis, C.D. NWR RE: haz. waste Site Cleanup Meeting Notes | Technical meeting at C.D. NWR called by J. Brittan, USEPA to discuss Sangamo dump site cleanup. Attended by USFWS, USEPA, Ill. DPA, Ill. DCC, Ill. EPA and political representatives. |

SANGAMO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. TYPE | DATE | TITLE | DESCRIPTION |
|-----------|---------------|---|---|
| | | | RIFS (PCBs), funding, study areas discussed. |
| 14 R | Jul. 1984 | By R. Ruelle, Rock Isl. & R. Adams, Cantonville, Ill USFS - Survey for Metals in Deer Livers, and in Abandoned Industrial Dumps on C.D. NWR. | A survey of published information on metals analyses in Deer, and Sangamo, Fire Station, Water Tower and Hampton Cemetery dumps. A brief site background included. Sangamo started in 1946 and left site in 1982 Data from June 15 & 16, 1983 and Dec. 1983. Deer - Mean Pb level of 5.6 ppm. Plants - As: 4.8 - 23 ppm in soils. Pb: 0.21-1.3 in Sangamo Dump; 0.25-0.65 in FS Dump; 0.17-0.95 in WT Dump; and 0.031 to 2.10 in HC Dump Soils at Sangamo Dump (ppm) - Ba: 850-3200; Cu: 700-3400; Fe: 42000; Pb: 1800-9500; Zn: 1900-10000. Soils at HC dump (ppm, max.) - Ba: 140; Cu: 81; Fe: 19500; As: 61; Zn: 145. Soils at WT dump (ppm, max.) - Ba: 140; Cu: 36; Fe: 25000; Pb: 37; Zn: 64. |
| 15 * | Jun. 22, 1984 | From Harold J. O'Donoghue, USFWS, Wash. DC. To D. Rosenberger, USFWS/ROA RE: Lead Contamination of White-Tailed Deer at the C.D. NWR, Illinois | Summary of 1980 S. Illinois Univ., Carbondale sampling of liver tissues from deer in 15 Illinois counties. Results indicate Pb range from not detectable to 13 ppm (dry weight) and averaged 4.4 ppm. Samples from the closed area of C.D. NWR (which includes Sangamo dump site) averaged 5.55 ppm. USFWS survey indicates 11 to 3.3 ppm wet weight. Also refer to July 1984 Survey by R. Ruelle & R. Adams. |
| 16 * | Jun. 15, 1984 | From Leanne Forbis, Columbia Arai,Bio-Chem. Lab, Inc To Glen Diarica, USEPA-DLPC, Marion, Ill. RE: PCB Analyses in Catfish | Six catfish samples were analyzed for PCBs; 0.47-3.64 ppm. |
| 17 * | Jun. 15, 1984 | From: USEPA/Res. Res. Program RE: Hazardous Waste Listing Under CERCLA | Summary of information on Sangamo Electric Dump Site covers 2 - 3 acres; USDOJ owns property; Dump used for by-products from manufacture of electrical components and capacitors; landfill is close to and drains into C.D. Lake. Soil at edge of landfill contains around 12000 ppm PCBs, and Pb in the range 7000 ppm. Soil samples between fill and lake show lower concentrations. |

SANGAMO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. | TYPE | DATE | TITLE | DESCRIPTION |
|------|------|--------------|--|--|
| | | | | City of Marion draws water from lake during peak demands; city pop. 1400. (In Reference # , pop. is 14031). |
| 18 | - | Jun. 1, 1984 | From James G. Britman, USDOE-FWS, Twin Cities, Mn To Valdas V. Adamkus, USEPA, Chicago, Ill RE: Hazardous waste Site at C.D. NWR | Provides a brief summary of the situation at the C.D. NWR site. Summary of Pb and PCB levels at Sangamo dump site and in fish; refers to 9/21/83 and 4/5/84 contract studies; and to Ill. EPA's 5/16/84 Enforcement letter to Interior Secretary Clark which outlines several demands concerning steps to remedy the C.D. problem. |
| 19 | * | May 31, 1984 | From - To USEPA-DLPC, Illinois RE: Proposed sampling of public water supplies | Memo on conference telephone call to discuss proposed sampling programs for dioxins and benzo furans in public water supplies. |
| 20 | * | May 31, 1984 | From Greg Wolf, USFWS to Files RE: Historical Summary of Contaminants on CD NWR | Fist investigations by Ill. EPA in 1975-76; Hg & PCB levels below FDA limits; some catfish and carp had 2 - 4 ppm PCB levels (5 ppm limit). Lake sediments (EPA, 1979) did not show elevated PCB levels. Analysis for lead in soil, veg., worms and mammals in Jun. 27 to Jul. 1, 1982 (Report in Feb. 1983). Pb levels in deer (Dec. 1983, reported in Apr. 1984) significantly lower than 1981 report from S. Ill. Univ. PCB in fish samples (IDOC/IDOC, Mar. 83) less than 1.1 ppm Sangamo dump soils (Univ. of Nebraska, Oct. 1983) had 250 ppb furans and 19.2 ppb dioxins. |
| 21 | * | May 30, 1984 | From Wayne Adams, USDOE to John Ellis, Twin Cities RE: PCB analysis - Fish Samples in C.D. NWR | Results of PCB analysis on fish collected 4/16/84 & 5/16/84. Concentrations well below FDA limits of 0.5 ppm for Hg, 0.3 ppm for Dieldrin, 0.3 ppm for Heptachlor, 5 ppm for DDT & analogs, and 5 ppm for PCBs. |
| 22 | * | May 28, 1984 | From Charles R. Bell, Ill. EPA to Iva Yankwood RE: Onco Orchard Lake Sampling | Memo on commercial laboratories (Wright St. Lab, Ohio & California Anal. Lab.) for dioxin & benzo furan analysis in water samples. |
| 23 | * | May 24, 1984 | From: Wayne Adams, USDOE to James Britman, USEPA RE: Sangamo Electric - C.D. NWR | Memo on operation at dump site: Sangamo was fist tenant on C.D. NWR in 1946, before area was turned to FWS. |

SANGANO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. TYPE | DATE | TITLE | DESCRIPTION |
|-----------|---------------|--|---|
| | | | deposit move north-northeasterly; water table 15 - 17 ft. Metals in well samples (ppm) - Al 265-2330; Fe 108-2440; Mn (10-145; Zn 80-751; Sn (20-90. Organics (ppb) - Endosulfate 0.048; lindane 0.008; chloroform (5-13; TCE 7; PCB 1254; heptachlor 0.005 |
| 29 R | Apr. 1984 | From R. Ruelie & R. Adams to Refuge Manager, C.D.NWR SUB: Survey for PCBs in Some Abandoned Ind. Dumps and Lake Sediments on C.D.NWR | Site background, review of reported PCB levels at dumpsite & fish. PCB (Aroclor, ppm) in sites - WT Dump: (0.03 - 0.15; mC Dump: (0.05; Area 10 soils: (0.05 - 0.07; U.S. Powder soils: (0.05 - 0.24; Creek below Sangamo Dump: 2.4 - 44; and Lake sediments: (0.05 - 0.76. |
| 25 * | Oct. 17, 1983 | From Wayne Adams, DOI to Dr. James Edler, HWS Doord. RE: Haz. waste Sites on Service Lands | Identified 4 sites on C.D. which may constitute a hazard. 1. Sangamo- (35000 cu.yd.) Pb, acetate, PCBs, Dioxins & furans 2. Fire Station Dump - Pb 3. Water Tower Dump - Pb 4. Supreme Flating - Pb, Co |
| 30 R | Oct. 7, 1983 | From Michael Gross, U. of Nebraska to R. Ruelie, FWS SUB: Analysis of PCDD & PCDF in Soil Samples | GC/MS Procedures, results of analysis (in ppb) - Tetra-CDD (n.d.), Penta-CDD (n.d.), Hexa-CDD (1.5), Hepta-CDD (1.5-3.2), Octa-CDD (7.1-19.2), Tetra-CDF (1.15-250), Penta-CDF (5.8-15.4), Hexa-CDF (2.8 & 12.2), Hepta-CDF (0.32 & 2.6), and Octa-CDF (1.2). |
| 46 C | Oct. 3, 1983 | By: M. O'Toole & S. Bynan, Ecology & Environment RE: Pot. Haz. waste Site - Site Inspection Report | A 10 Part SITE INSPECTION REPORT on C.D. NWR/Sangamo Dump conducted on Sep. 16, 1983. Soil surface heavily contaminated with Pb arsenate, Aroclor 1254, Aroclor 1242, Orthochlorodibenzo-p-dioxin, Tetrachlorodibenzofuran, Pentachlorodibenzofuran, Hexachlorodibenzofuran & Heptachlorodibenzofuran. Contamination along swale downstream of dump. waste dumped in a swale, buried & covered with soil. Cover has eroded since Sangamo & USFWS covered material.. Provides estimates of permeability, rainfall, etc. |
| 21 * | Sep. 30, 1983 | From Scott Bynan to File RE: C.D. NWR - Sangamo Dump | Memo on site visit & geophysical work - magnetometer survey to locate buried metal, & seismic refraction to determine |

SANGAMO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. TYPE | DATE | TITLE | DESCRIPTION |
|-----------|--------------|---|--|
| | | | Dump site established in cooperation with FWS; waste oil and other debris trucked to dump site, and burned with refuge fire trucks and firemen standing by. Abandoned in late 50's, early 60's without fill dirt or cap |
| 50 L | May 22, 1984 | From J. Craig Potter, USFWS to Senator Alan Dixon RE: Presence of PCBs in Onondaga Lake Ecosystem | Background of situation and results of sampling program. |
| 24 L | May 16, 1984 | From Richard Carlson, ILL. EPA to Wayne Adams, FWS RE: Notice of Sealing of Site | Notice provides site background; site used as an ammunition handling facility; powerful explosion at site may account for high Pb levels; site leased by Sangamo from USDOJ from 1946 to 1962; 20000 ppm PCB levels and 7000 ppm Pb levels. |
| 25 LR | May 8, 1984 | From Robert Hite, EPA-DWPC to Richard Ruella, FWS Sub: PCB monitoring in O.G. Lake | Concentrations of PCBs & selected organochlorine compounds at 16 sites in O.G. Lake and O.G. Creek upstream of Lake. Water samples: PCBs, dieldrin, chlordane, DDT, Endrin, methoxychlor, BHC, hexachlorobenzene and aldrin less than detection limits (0.02 ppb for chlordane, 0.01 ppb for others); pentachlorophenol 10.01 at 8 sites (0.018 max.) Sediment samples: PCBs (10 to 270 ppb; dieldrin (1; chlordane (5); total DDT (10; and heptachlor-epoxide (1 ppb. |
| 51 D | May 8, 1984 | From ILL. EPA, DWPC to US Fed. Penitentiary RE: TCM Analysis Report | Quarterly samples from Refuge Fire Dept., Roads & Grounds, Safety Office, Industrial Bldg.. On 4/24/84, TCMs ranged from 0.023 - 0.240 ppm, with 0.132 ppm average; on 1/27/84, 0.139 - 0.190 ppm, with 0.175 average; on 11/9/83, 0.120 - 0.150, with 0.138 average; and on 7/26/83, 0.137 - 0.245, with 0.139 average. |
| 26 L | May 4, 1984 | From Bob Thomas DWPC to Jim Frank, DWPC RE: PCBs in O.G. Lake/Sangamo Dump Site | O.G. Lake one of 17 lakes monitored as part of Fish Contaminant Monitoring program; there are no excursions of the 5.0 ppm FWS action level for PCBs. |
| 27 R | Apr. 5, 1984 | From Michael Gifford, Ecology & Environment, Inc. SUB: ILL/DOE RE-8308-06A : O.G. NAR/Sangamo Dump | Three groundwater monitoring wells sampled per Tech. Direction Doc. ILL/DOE RE-8308-06A, and four on-site springs Drilling logs, hydrogeo background - O.G. Lake man-made; fed exclusively by surface run-off; groundwater in glacial |

SARGANO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. TYPE | DATE | TITLE | DESCRIPTION |
|-----------|--------------|---|---|
| 36 R | Apr. 4, 1983 | From Ill.DOA to Les FFraxland, Ill.DOB RE: Toxicology Report on Fish | Composite fish samples for PCBs (no data). |
| 37 R | Mar 1983 | From R. Ruelle, FWS to Refuge Manager SUB: Survey for PCBs on D.O. NWR | Review of PCB toxicity to fish & mammals. 7/27/82 PCBs data(ppm) in Electric duno soils (12 - 20054) & sediment (0.2 - 3.32); June/Sep '82 fish data (10.02 - 9.3); and Dec.'82 data on deer fat (10.27) & tissue (10.10) |
| 38 R | Feb 1983 | From R. Ruelle, FWS to Refuge Manager SUB: Mercury Levels in D.O. Lake Largemouth Bass | Review of Hg data: for 1978, 0.13 - 0.45 ppm; for 1982, (0.05 - 0.35 ppm. Sep.'82 PCB (10.2 - 9.3 ppm) and Pb (10.1 - 0.14) included. |
| 39 R | Feb 1983 | From R. Ruelle, FWS to Refuge Manager SUB: Survey for Lead on D.O. NWR | Background on study area, methods & results. Soil samples from top & 1 ft depth, earthworks, rice, etc. June 27 & July 1, 1982 samples collected from 10 sites - Greenhorn Control, Camoria Neck Control, Sargamo Dump, Jobs Corps, U.S. Powder, FS Dump, WT Dump, HD Dump, Carterville Hunting Area, and Area 13 Orchard. |
| 40 R | Jan 1983 | By A. Wolff, et al. in Trans. Ill.St.Academy of Sci. SUB: Regional Variation in Metals in Livers of White-Tailed Deer in Illinois | 1980-81 data for nine heavy metals in livers of 441 white- tailed deer in 26 Illinois counties. In D.O.NWR, mean concentrations (in ppm) were - Cd 0.43, Co 0.36, Cr 3.1, Cu 115, Hg 211, Mn 8.4, Ni 4.5, Pb 5.6 & Zn 23. |
| 41 R | Oct.13, 1982 | From R. Adams, FWS to IDWR Project Manager RE: Chemical Contamination on D.O. Refuge | Summary of data gathered over past year - 1982 Reports by R. Ruelle, and 1981 Ill. DWR sampling data. PCBs only on Sargamo Dump, PCBs & Pb in all 12 sites. Sargamo dump - Pb >10000 ppm, and PCBs 120000 ppm. |
| 54 D | Dec. 1981 | From Ill.DOA to FWS RE: Results from Deer Sampled at D.O. NWR | Unlabeled pesticides analyzed in deer fat; detection limits were 0.01 to 0.10 ppm. None detected, except dieldrin (0.02-0.03 ppm) & heptachlor epoxide (0.005-0.05) in one sample. |
| 42 R | Jul 1981 | From Staff, Monitoring Unit, Ill.EPA. SUB: Biological & Nat. Qual. Survey of D.O. Creek | Background on City of Marion treatment plant - pop. 12000; WTP has southwest aqpon for remediation, bio-locks. |

SARGANO ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. # | TYPE | DATE | TITLE | DESCRIPTION |
|--------|------|---------------|---|--|
| | | | | depths. Landfill area 2.5 acres; depths 6 - 10 ft. |
| 32 | X | Feb. 5, 1983 | From David Stallings, FWS to R. Ruelle RE: Review of PCDD & PCDF Report from M. Gross | Interpretation of data in report (8/26/83). Discusses relation of PCDDs & PCDFs to PCB levels in soils & toxicity. |
| 33 | - | Aug. 25, 1983 | From Michael Gross, D. of Nebraska to R. Ruelle, FWS RE: PCDDs & PCDFs Data | See Report dated Oct. 7, 1983 from M. Gross |
| 47 | X | Aug. 11, 1983 | From Walter Redmon, USEPA Reg. V to Kenneth Fenner RE: Trip Report - Meeting at C.D. NWR | Meeting on contamination of the Refuge with PCBs, Pb, etc. Reviewed 3 FWS Reports on PCB, Pb & Hg levels by R. Ruelle, Aerial photos, history of occupants, & maps with M.D. Toole. Items collected on site include capacitors with Sargamo USA on them, and other pieces that have been found at other old disposal sites and suspected to have originated from World War II munitions plants. In the past 10 yrs, Refuge has disposed 5,000,000 pounds of stored explosives. Widespread problem appears to be lead. |
| 34 | X | Aug. 1, 1983 | From Gerald Upicks, FWS to Files RE: Meeting at C.D. on Haz. Dump Site | Synopsis of meeting on 7/21/83 attended by FWS, Ill. EPA, Ill. DOD and USEPA at Refuge H3. |
| 52 | X | Jul. 21, 1983 | From M. D. Toole, USEPA to Russel Diefenbach RE: Onap Orchard, Marion Trip Report | Meeting at C.D. NWR attended by USFWS, Ill. EPA, Ill. DOD & Ill. EPA to discuss discovery of PCB dump leaching into C.D. Lake. See also Memo of Aug. 11, 1983 by Walter Redmon. 2.5 acre Sargamo Dump is on east end of C.D. Lake. Dity of Marion pop. 13,176 Lake water for refuge: 230,000 ppg 1975 Ill. EPA: 11-27 ppg PCB in lake sediments; June 1982 USFWS: 1235-20594 ppm PCBs in soil; May 1983 EPA: 12-170 ppg PCB in sediments; 1984: 34 ppg PCBs in Marion Reservoir. |
| 53 | - | Apr. 10, 1983 | From David Kenney, Ill. DOD to J. Brittan, FWS RE: Fish Sample Analysis Report for C.D. Lake | Fish fleet analyzed by Ill. DOD. Highest PCB level 1.10 ppm. See Memo of 4/11/83 by F. Paladino |
| 55 | X | Apr. 11, 1983 | From Peter Paladino, Ill. DOD to Mike Carter RE: Contaminant Sampling of C.D. Lake | Results of PCB (Arcochlor 1254, in ppm) analysis in large mouth bass (0.12 - 0.34), channel cat (0.34 - 1.1), bluegill (n.c.), W. drapelle (n.c.), cullhead (n.c.), and carp (0.01-0.06) |

SANITARY ELECTRIC - REVIEW OF PREVIOUS INFORMATION

| REF. NO. | DATE | TITLE | DESCRIPTION |
|----------|----------|--|---|
| | | in Vicinity of Marion Wastewater Treatment Plant, Marion, ILL. 1975-1980. | Tables of water quality data for 1975-80 included. C.O. Creek downstream of WTP remains adversely affected with high ammonia-N and phosphorus, low dissolved oxygen. Considerable organic enrichment of east arm of Lake. |
| 43 R | 1981 | By: M.H. Kelly & R.L. Hite, Monitoring Unit, Ill.EPA Sub: Chemical Analysis of Surficial Sediments from 63 Illinois Lakes, Summer 1979 | 273 sediment samples collected from 63 Illinois lakes in Summer 1979 were analyzed for VS, COD, nutrients, heavy metals, and organochlorine compounds. C.O. Lake: 6965 acre area, 30 ft. max. depth, 109061 acre watershed drainage area, 63511 acre-ft storage capacity, 0.739 yr retention time. Two sites & 2 samples/site reported. *77 Hite & King: VS 5X, Total N 0.16 ppm, Total P 0.13 ppm Tables of values included. |
| 44 R | Apr 1977 | By: R.L. Hite & M. King, Ill.EPA Sub: Biological Investigation of the C.O. Creek Basin Basin - Summer 1975 | 70 stream locations in Williamson & Jackson counties, and 15 locations in C.O. Lake for benthic macroinvertebrates. Good water quality generally found in streams in the southern portion of the basin where C.O. NW & Shawnee Benthic conditions evident in Little C.O. Creek & Piles Fork from Carbondale to confluence with C.O. Lake. Bottom sediments at 2 sites in C.O. Creek downstream from Marion had elevated levels of heavy metal & pesticides. PCBs notably higher in C.O. Creek sediments. Selected contaminants in fish flesh below FDA limits. |

ATTACHMENT S-8
FIELD RECONNAISSANCE SKETCHES
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
AND
SANGAMO-WESTON, INC.

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221



O'BRIEN & GERE



| SUBJECT | SHEET | BY | DATE | JOB NO. |
|---------|-------|----|---------|---------|
| | 29 | | 3/28/85 | |

#3 AREA 11 ~~East~~ ^{South} LANDFILL

Suck to 1 ft

3 soil compos.

2. Sed. compos.

- mound
- East
- west
- swamp
- lower stream

White stones
few chunks
black tar.

Nice
metal cans (drums?)

RE track

Flack

Pumice
blocks

drum
glass
metal

lead? casing
(asin on bot?)

fence

~40" ϕ culvert

scattered
RE ties
& tracks

trucks

concrete

conistors

RE ties

2" ϕ pipes

swamp
sed.

drum to

plastic

conistors

cinch

exposed wood

trash

trash

Metal, mesh,
brick

24" Pipe

Stack of trees

metal & conistors

conduit / 4" stl. plates

black tars or ash in stream

metal & plastic debris along stream

fence

Stream

water flowing into
around here.

Gully w/ drums

Gully w/
concrete/metal
rebars/pipes

drums

Swamp

Swamp

Gully

trash



O'BRIEN & GERE

SUBJECT

SHEET

31

BY

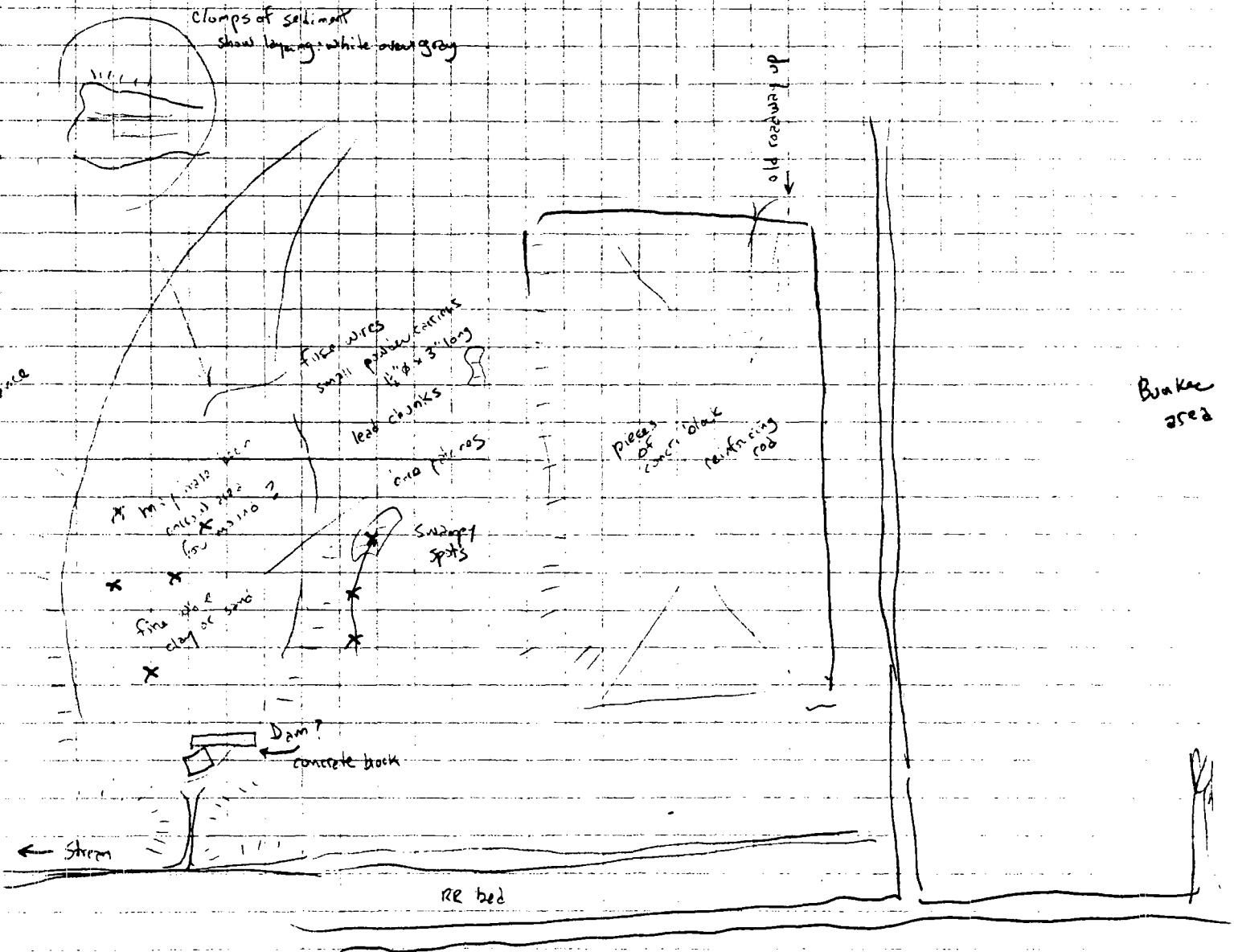
DATE

3/29/85

JOB NO.

#4 AREA II NORTH LANDFILL

RDX or magnesium stored or sawed?



2 composites:

- 1 bare patches
- 1 swampy sediments



O'BRIEN & GERE

SUBJECT

SHEET

24

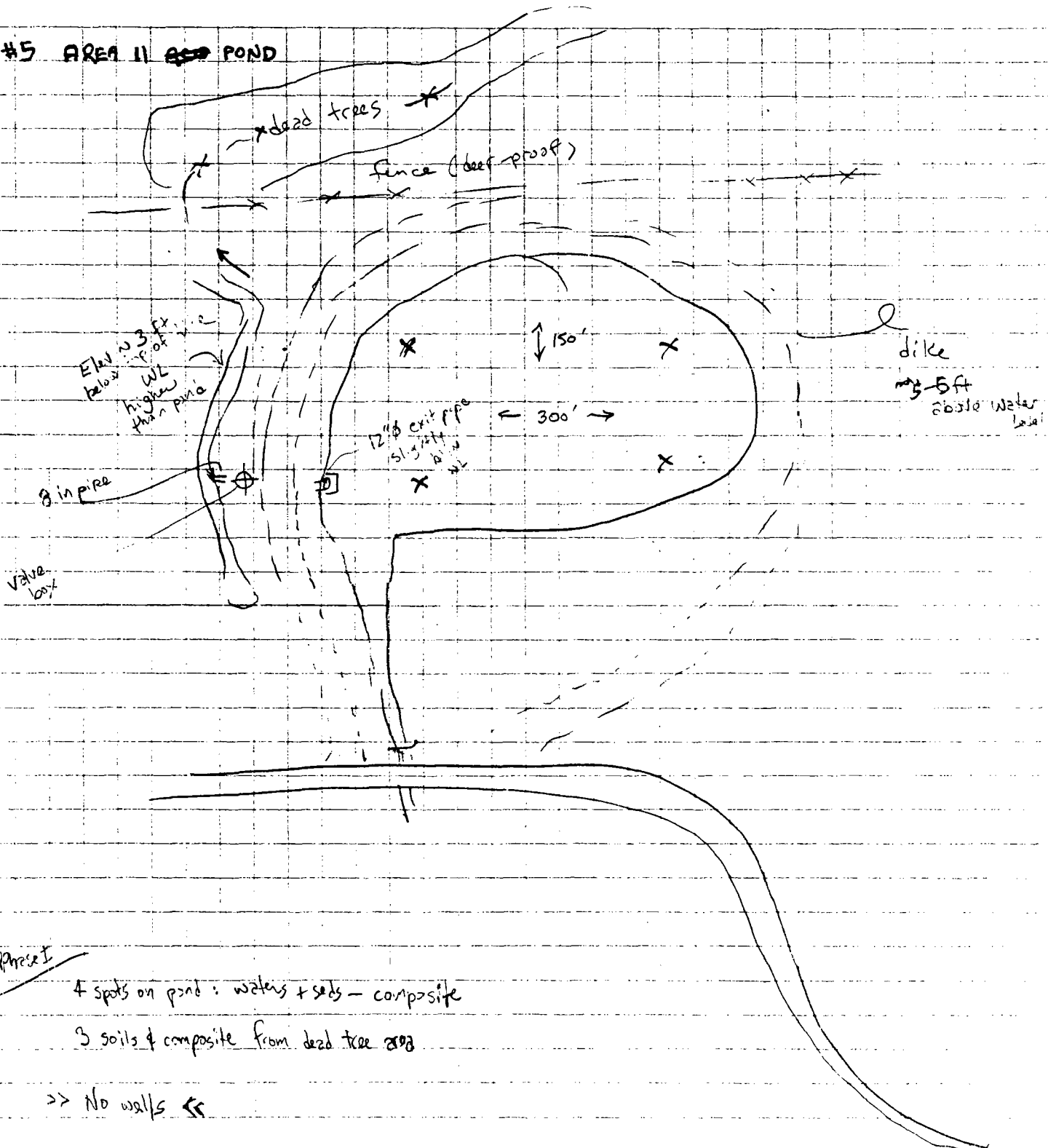
BY

DATE

3/7/05

JOB NO.

#5 AREA 11 ~~ARE~~ POND



Phase I

4 spots on pond: waters + sed - composite

3 soils & composite from dead tree area

>> No walls <<



O'BRIEN & GERE

| SUBJECT | SHEET | BY | DATE | JOB NO. |
|---------|-------|----|---------|---------|
| | 13 | | 3/27/85 | |

OVERCAST & WINDY

#7A D-AREA NORTH LAWN

barrels emptied on the ground

1. Map. Survey

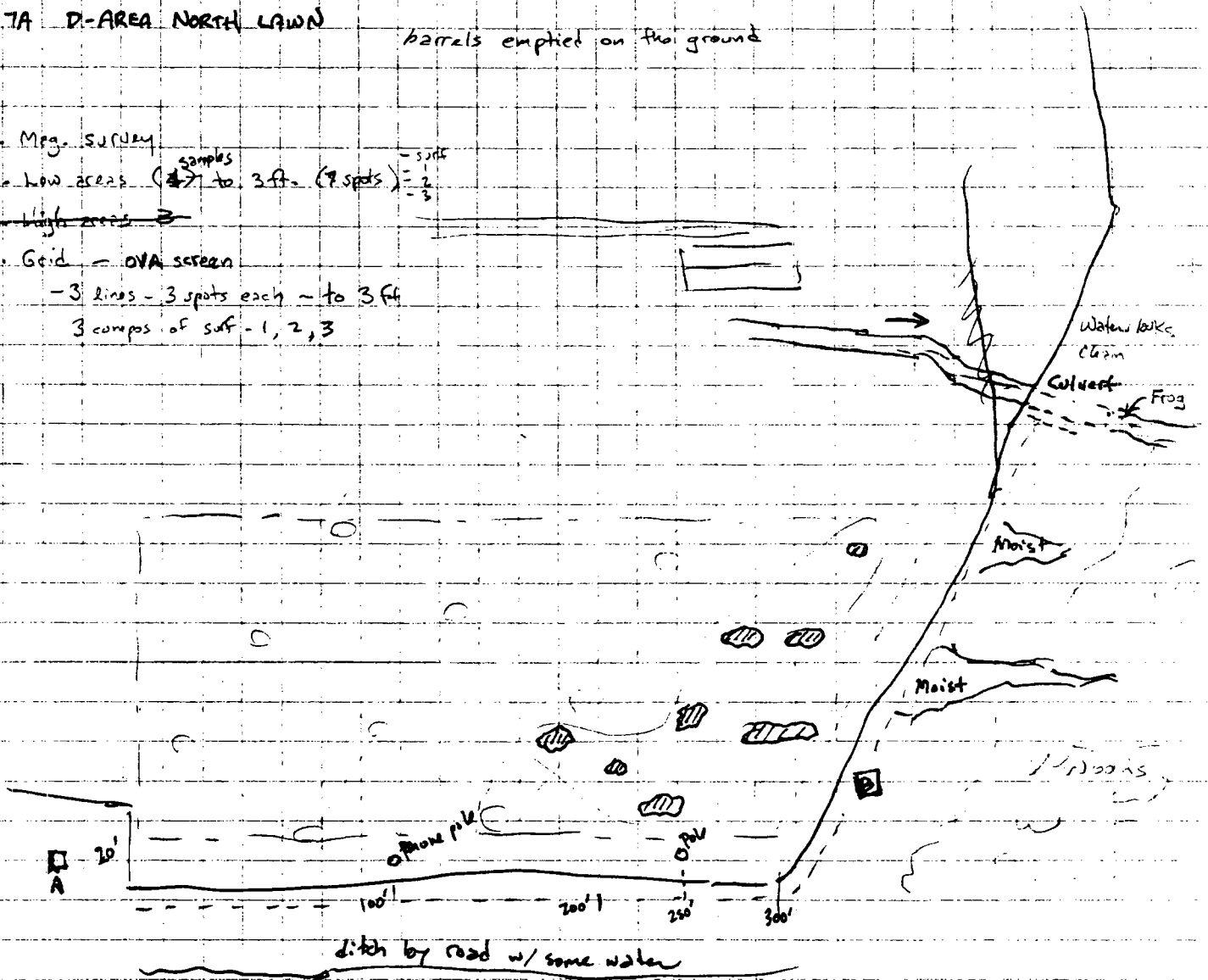
2. Low areas (47 to 3 ft. (9 spots) - surf

3. High areas -

4. Grid - OVA screen

- 3 lines - 3 spots each - to 3 ft.

3 compos. of surf - 1, 2, 3



depressed brown patches

OVA (Neg. rds.)

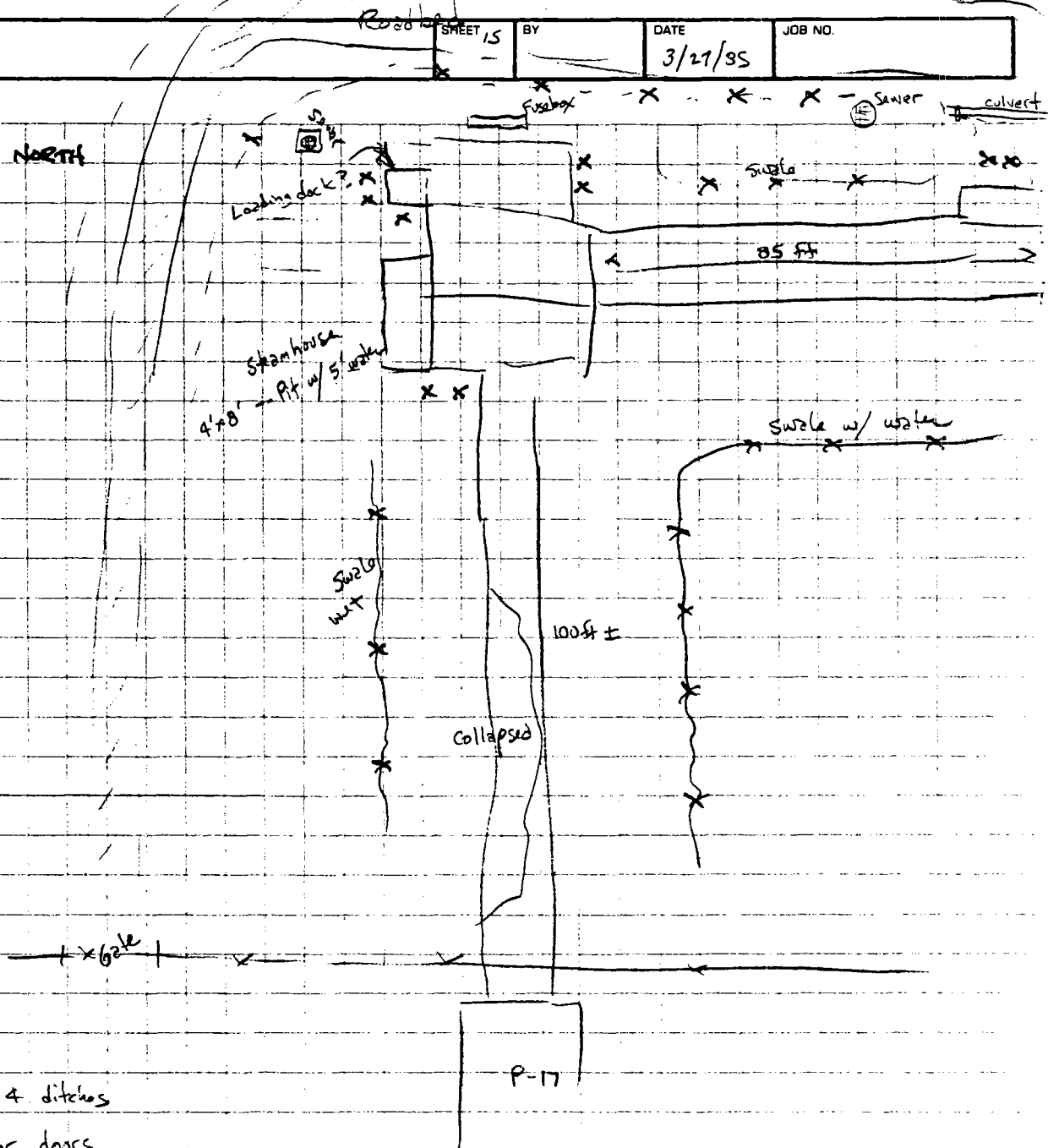


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Sheet 2

| | | | | |
|---------|----------|----|---------|---------|
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| | | | 3/27/95 | |

#11A P AREA NORTH



Phase I

- Composites from 4 ditches
- Grab surfaces near doors



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SUBJECT

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22

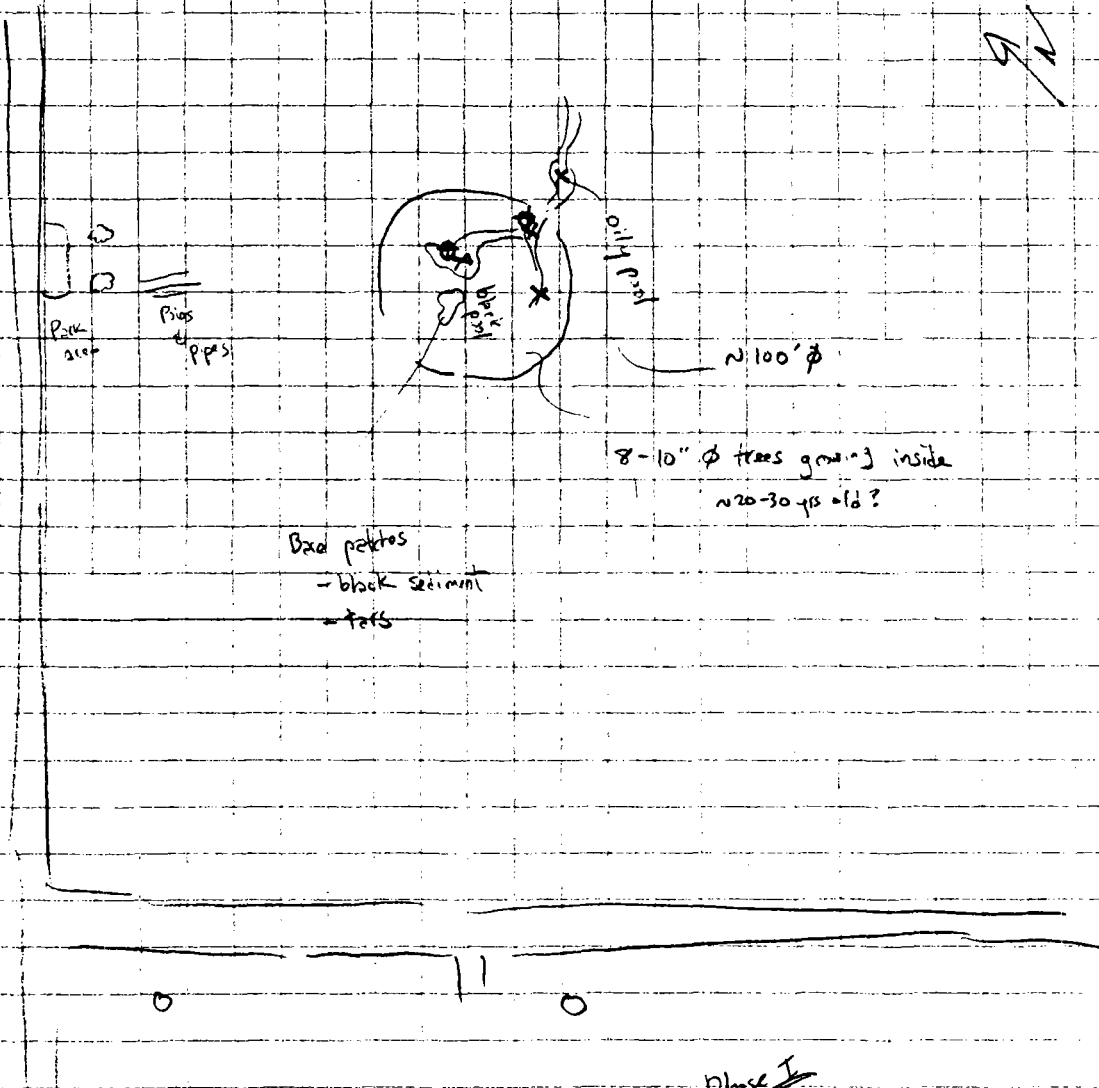
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DATE

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JOB NO.

#12 AREA 14 LANDFILL



(#13)

Phase I

4 water grabs & composite

2 sed. composited

34 grabs of black residue & composite



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SUBJECT

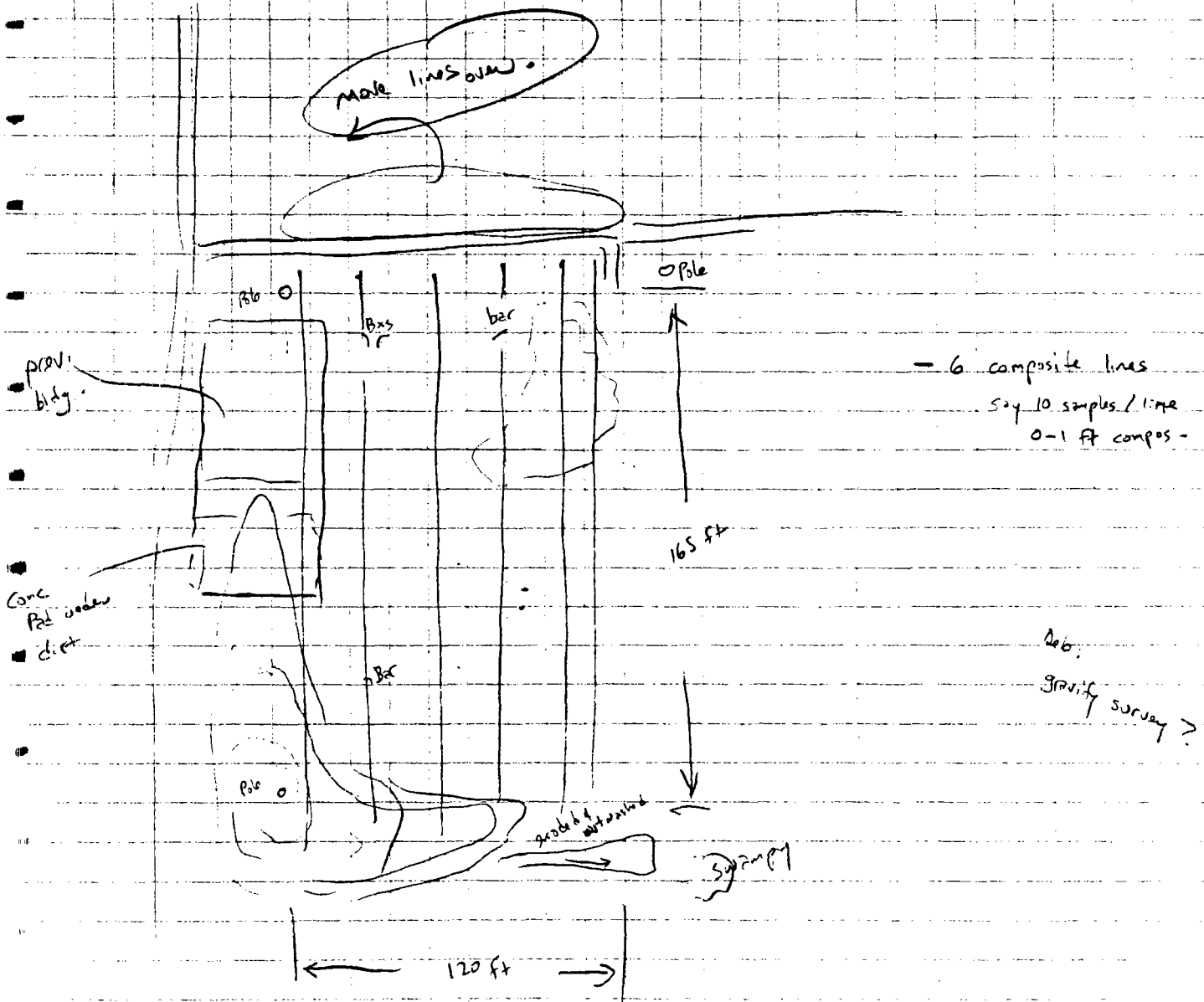
SHEET
21

BY

DATE
3/27/85

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#12 AREA 14 LANDFILL
#13 AREA 14 CHANGE HOUSE SITE





O'BRIEN & GERE

| | | | | | |
|---------|------------------|-------------|----|-----------------|---------|
| SUBJECT | PP ¹² | SHEET 20 | BY | DATE 3/27/85 | JOB NO. |
|---------|------------------|-------------|----|-----------------|---------|

#14 AREA 14

SOLVENT STORAGE

compressed gas

- N comp. water
- N comp. sed
- S comp. water
- S comp. sed

standpipe
(water bubbling up)

compressed gas

ditch

ditch

DRUMS (N 50-100)

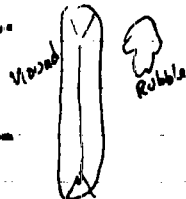
TIS
MACHINE

sample the ditch

stacked barrels (N 200)

spill containment dike open.

TB: DIACETONE ALCOHOL
TY: DIETHYLENE GLYCOL
TIO: METHYL CELLOSOLVE



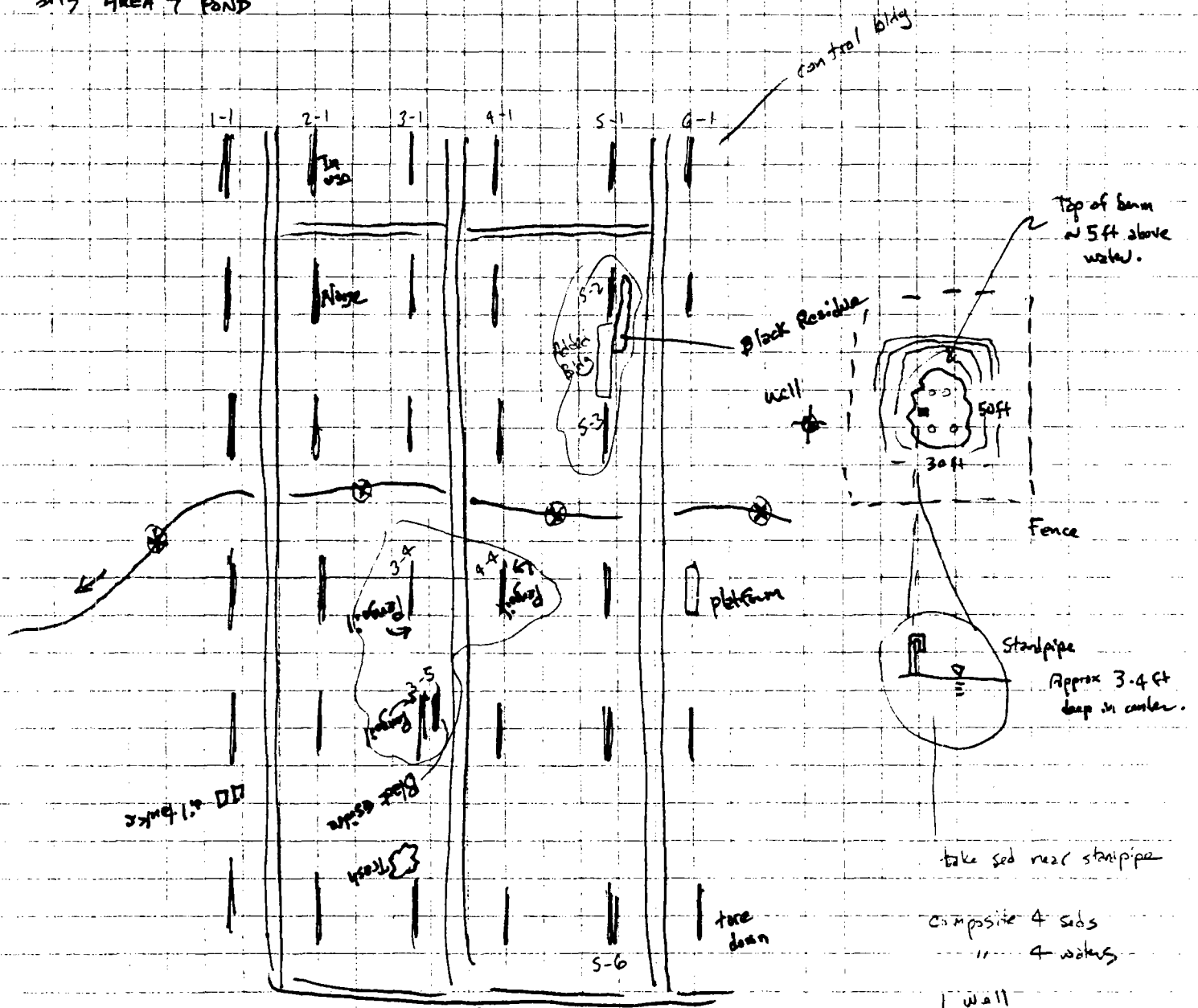


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| | 23A | | 3/27/85 | |

#16 AREA 7 INDUSTRIAL SITE

#15 AREA 7 POND



Creek: 4 stations - 1 water + 1 sed @ each.

4 buildings - 2 composites per bldg (front + back)

Surf to 1 ft composite - each of 6 samples per side

(5-2 & 5-3 are treated as 1 bldg)

1 control bldg - S. side only

meets control @ other bldg



O'BRIEN & GERE

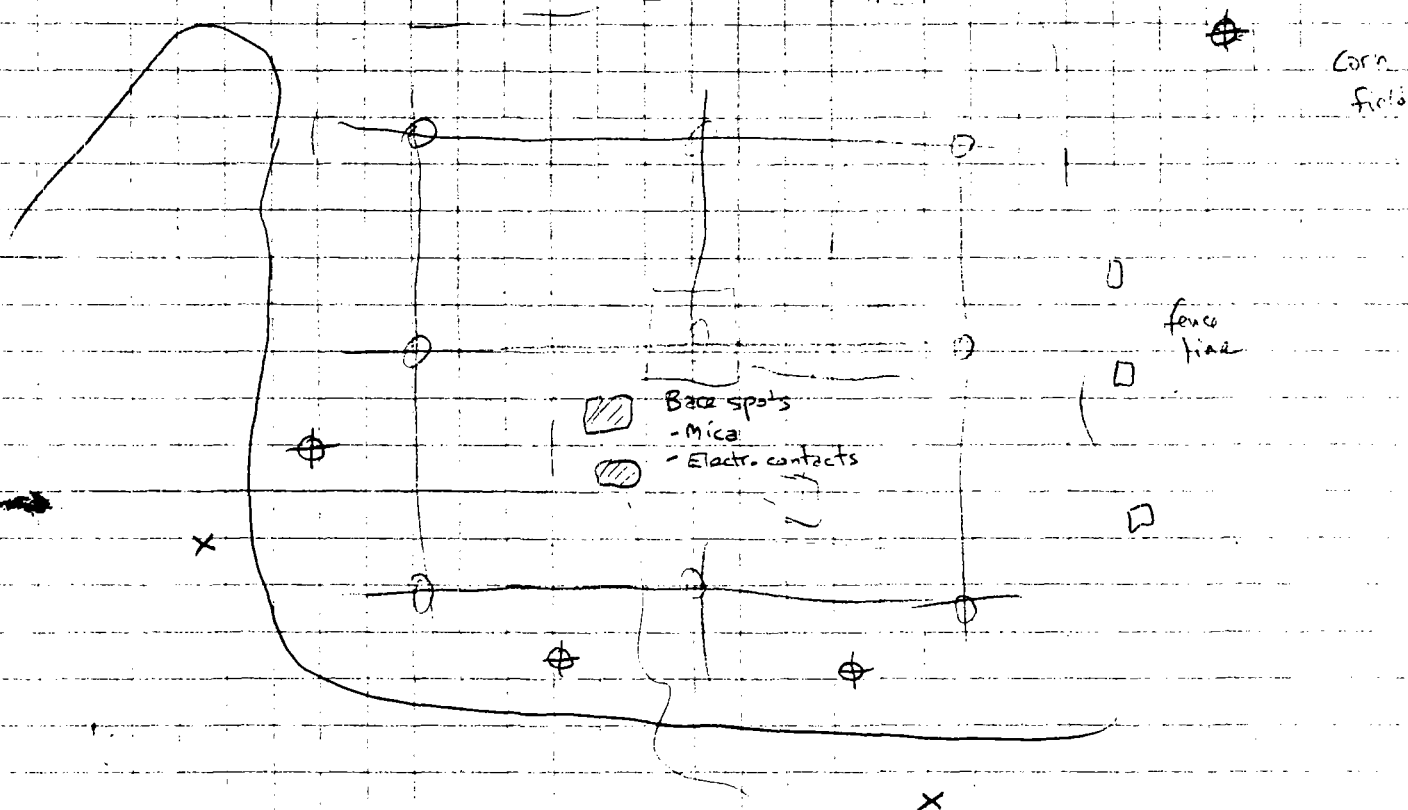
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|---------|-------|----|-------|---------|
| | 14 | | 3/27/ | |

1617 JOB CORPS LANDFILL

1956 Illinois Lic # 2069482

other debris goes down several inches

Debris widely scattered on surface



1. Mag. Survey
Seismic or Radar

2. Coras: surf and/or depth.

- 2 base spots

- 5 Squares

~ surf. composites within - deeper if radar says so.

digging with trowel: found
debris only on surface (top inch)

3. 4 shallow wells } Indicators Phase I / PPS Phase II if hits in soil
4. 2 surf. waters (pond)



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SUBJECT

SHEET

BY

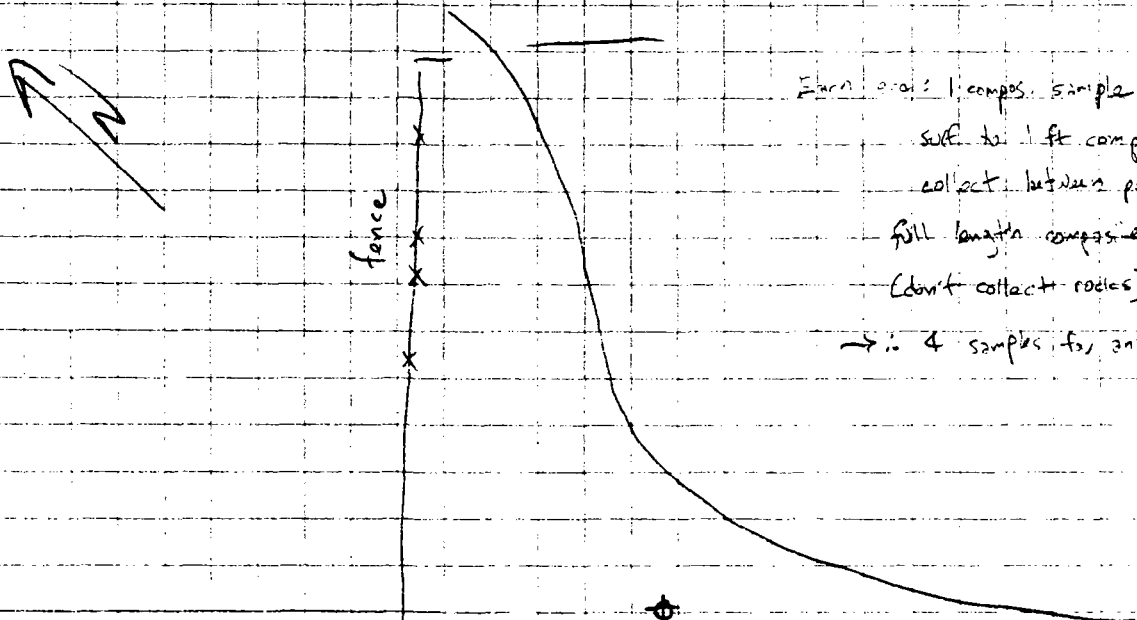
DATE

JOB NO.

26

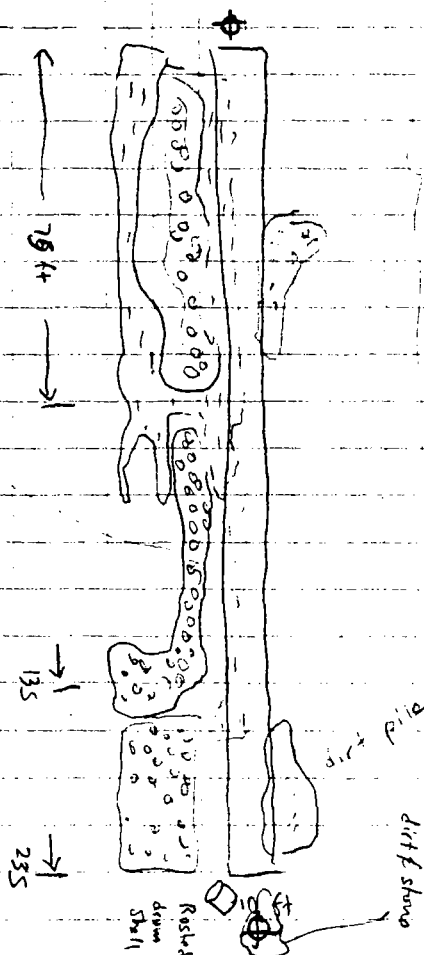
3/28/85

#18 AREA 13 LOADING PLATFORM



Stone was RR balling

rust
stone



No unusual
vegetation
changes
on this

dirt pile
Rubble
Pile
dirt stone

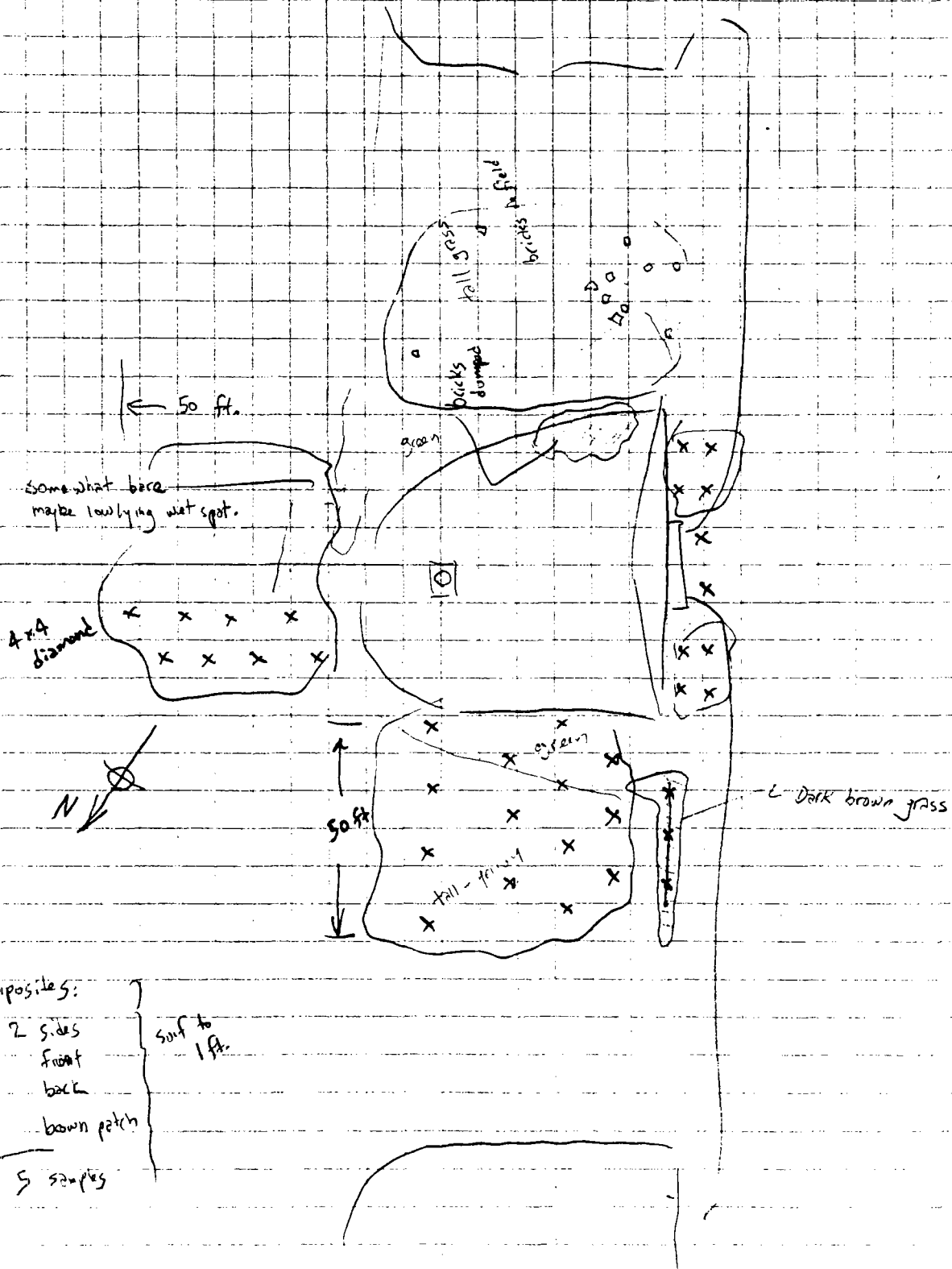
Rusted
drum
shell



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| | 27 | | 3/28/85 | |

#19 AREA 13 BUNKER #B 1-3





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SUBJECT

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BY

DATE

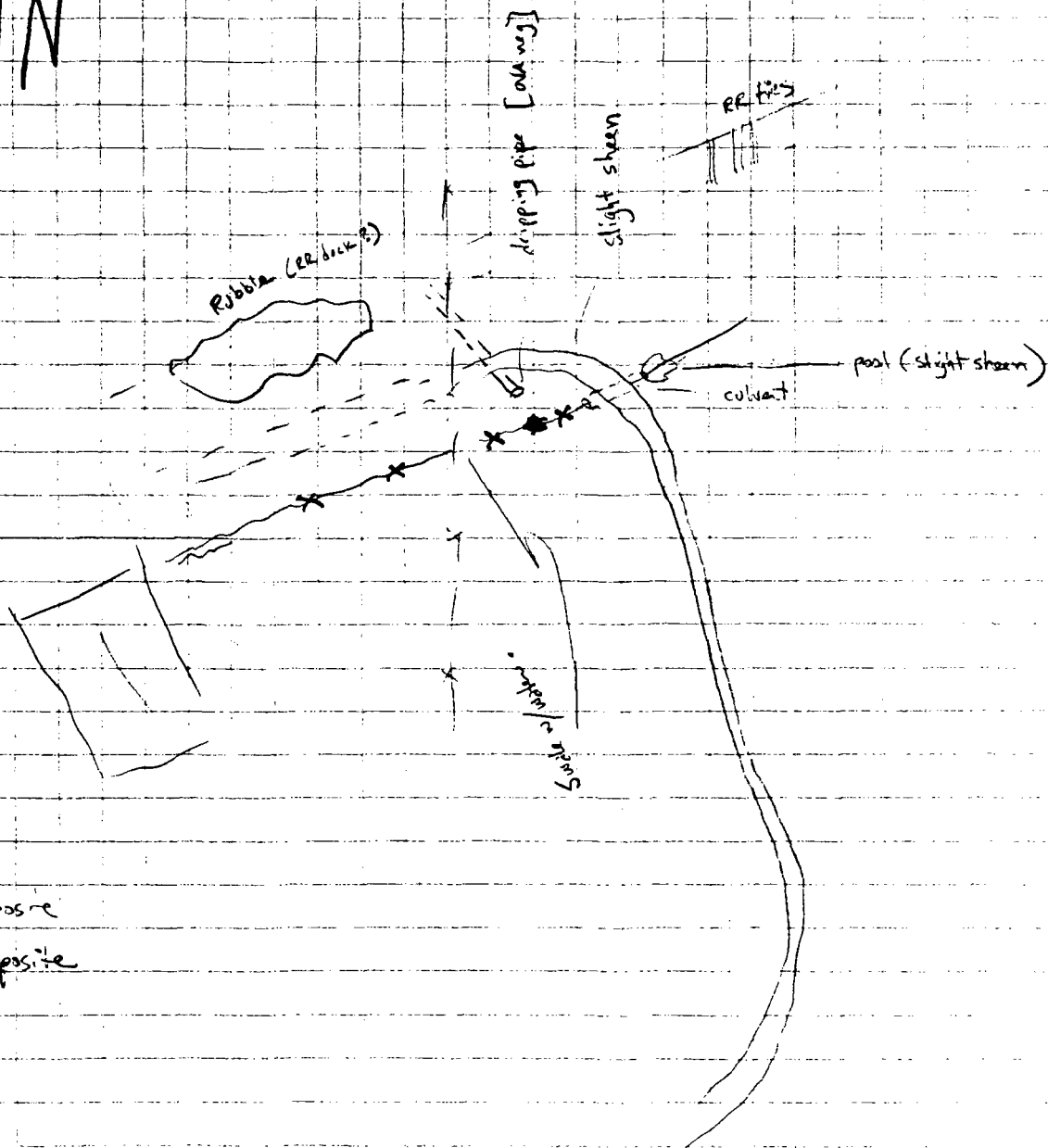
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3/27/85

#20 D AREA SOUTH

N



4 water & composite

4 seps. & composite



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SUBJECT

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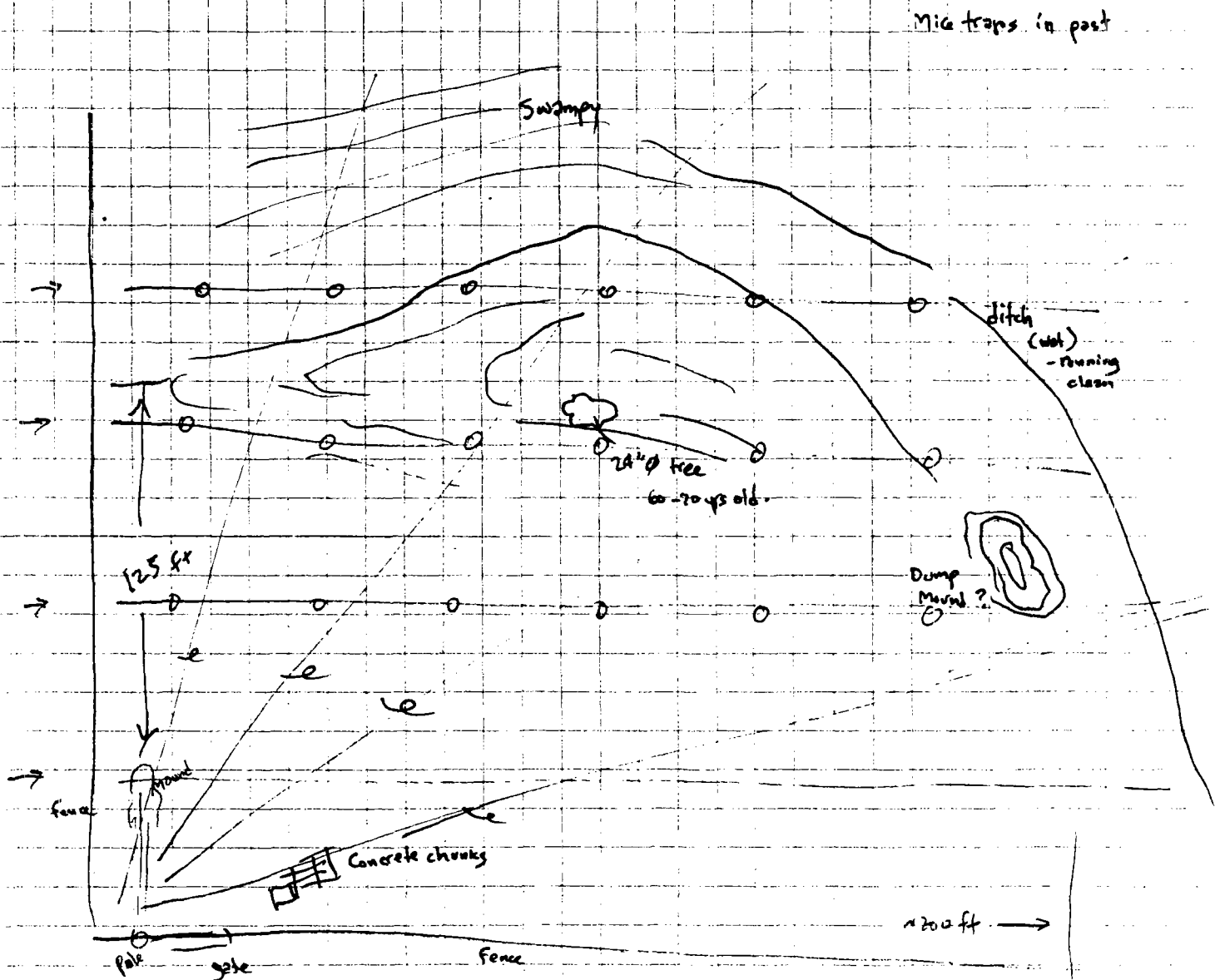
BY

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3/27/85

JOB NO.

#21 SOUTHEAST CORNER FIELD



4 Magnetic transects

4 compasses at (6 along each transect - surf to 1 ft)

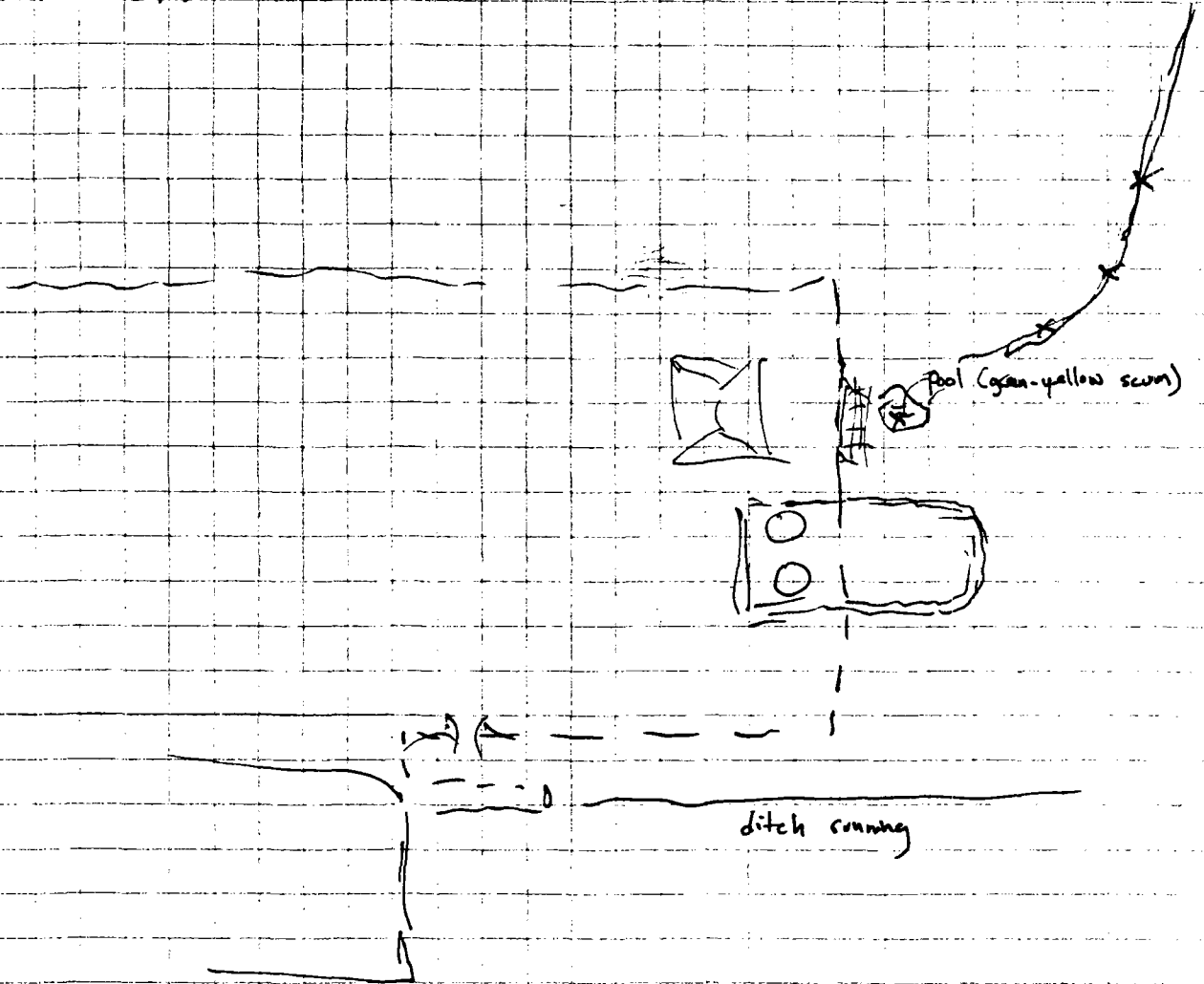




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| | | | | |
|---------|-------------|----|-----------------|---------|
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|---------|-------------|----|-----------------|---------|

* 22 OLD REFUGE SHOP



Phase I

1 - water from pool

- composite 2 seds downstream.

Phase II

further & deeper, if necessary

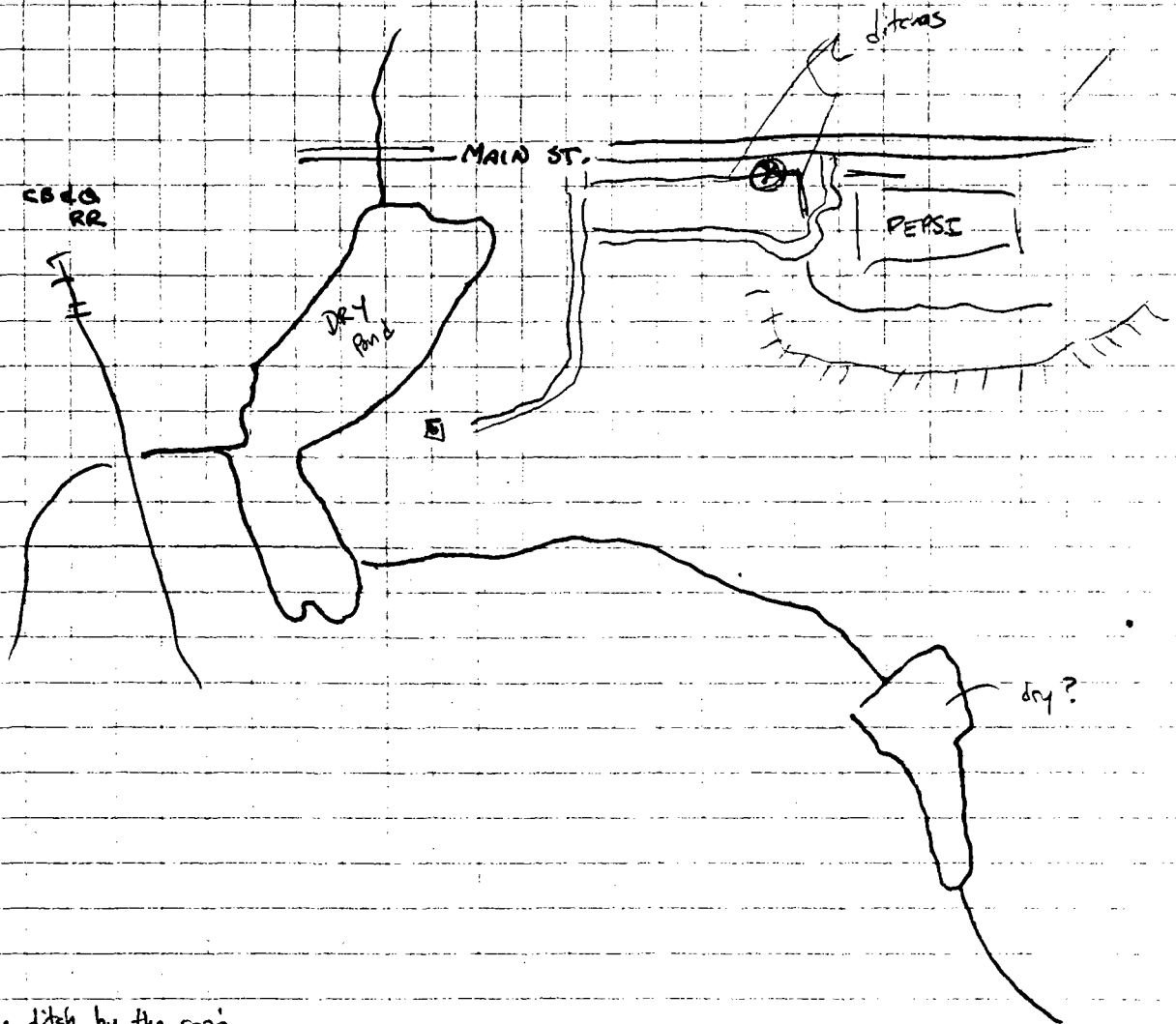
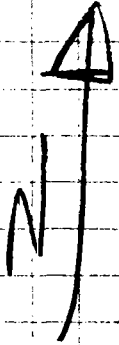
9/13



O'BRIEN & GERE

| | | | | |
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#23 PEPSI EAST
#24 PEPSI WEST



sample ditch by the road.



O'BRIEN & GERE

SUBJECT

SHEET

BY

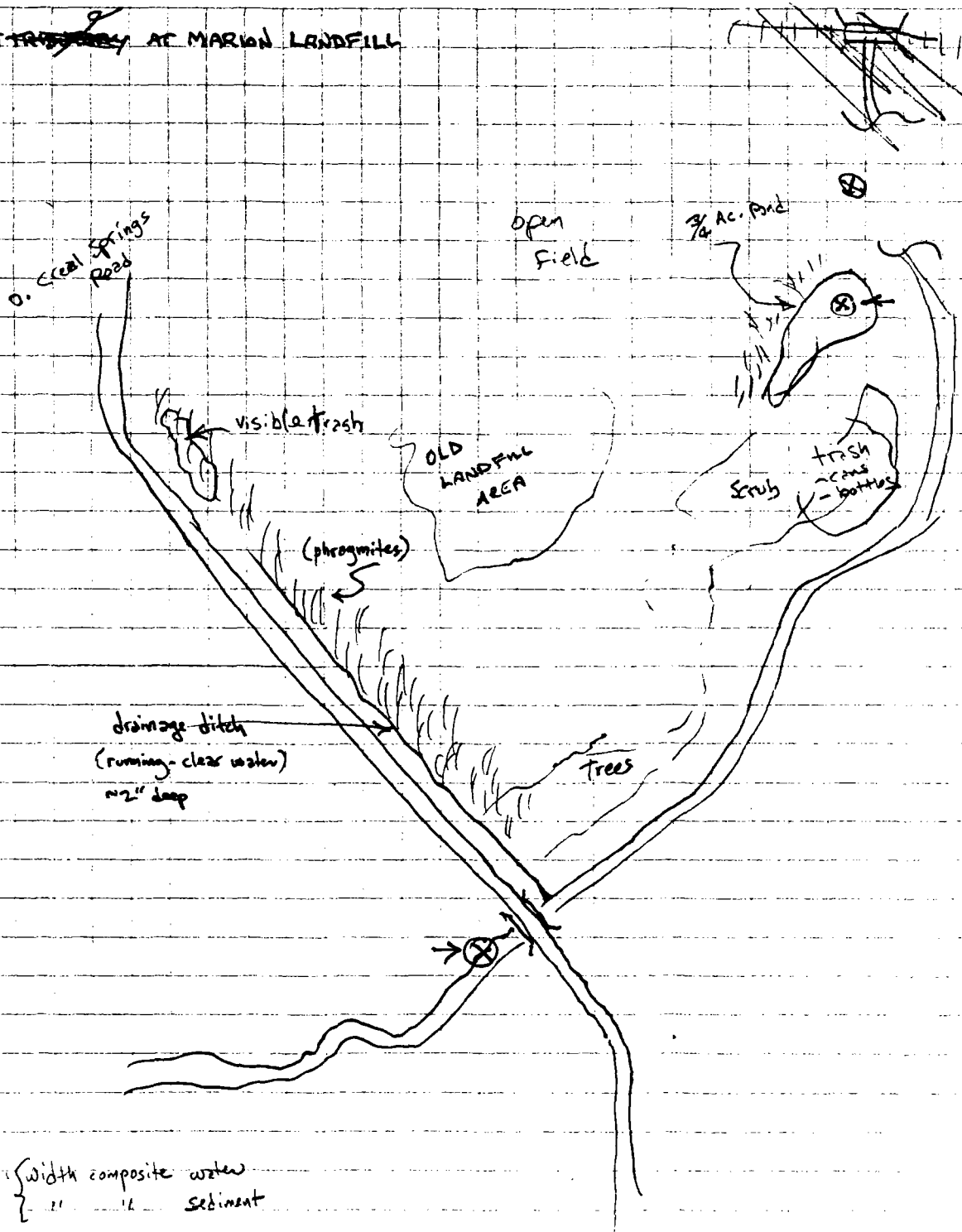
DATE

JOB NO.

32

3/28/85

#25 COC ~~AT TRASH~~ AT MARION LANDFILL



downstream : { width composite water
 : { " " sediment

upstream : { same

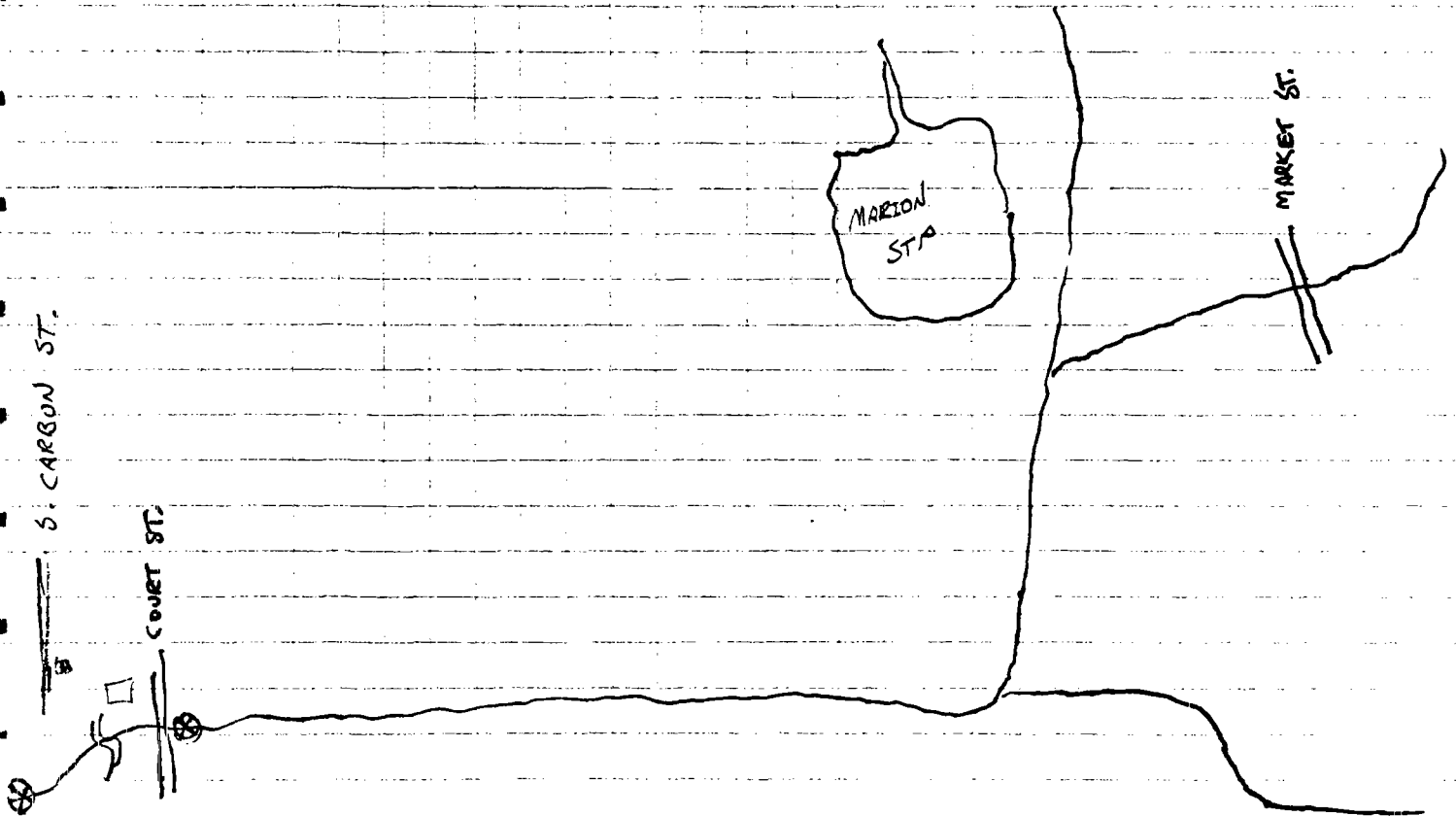
Pond : { same



O'BRIEN & GERE

| | | | | |
|---------|-------------|----|-----------------|---------|
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26 COC ~~REVISION~~ ^{BELOW} MARION STP





O'BRIEN & GERE

SUBJECT

SHEET

35

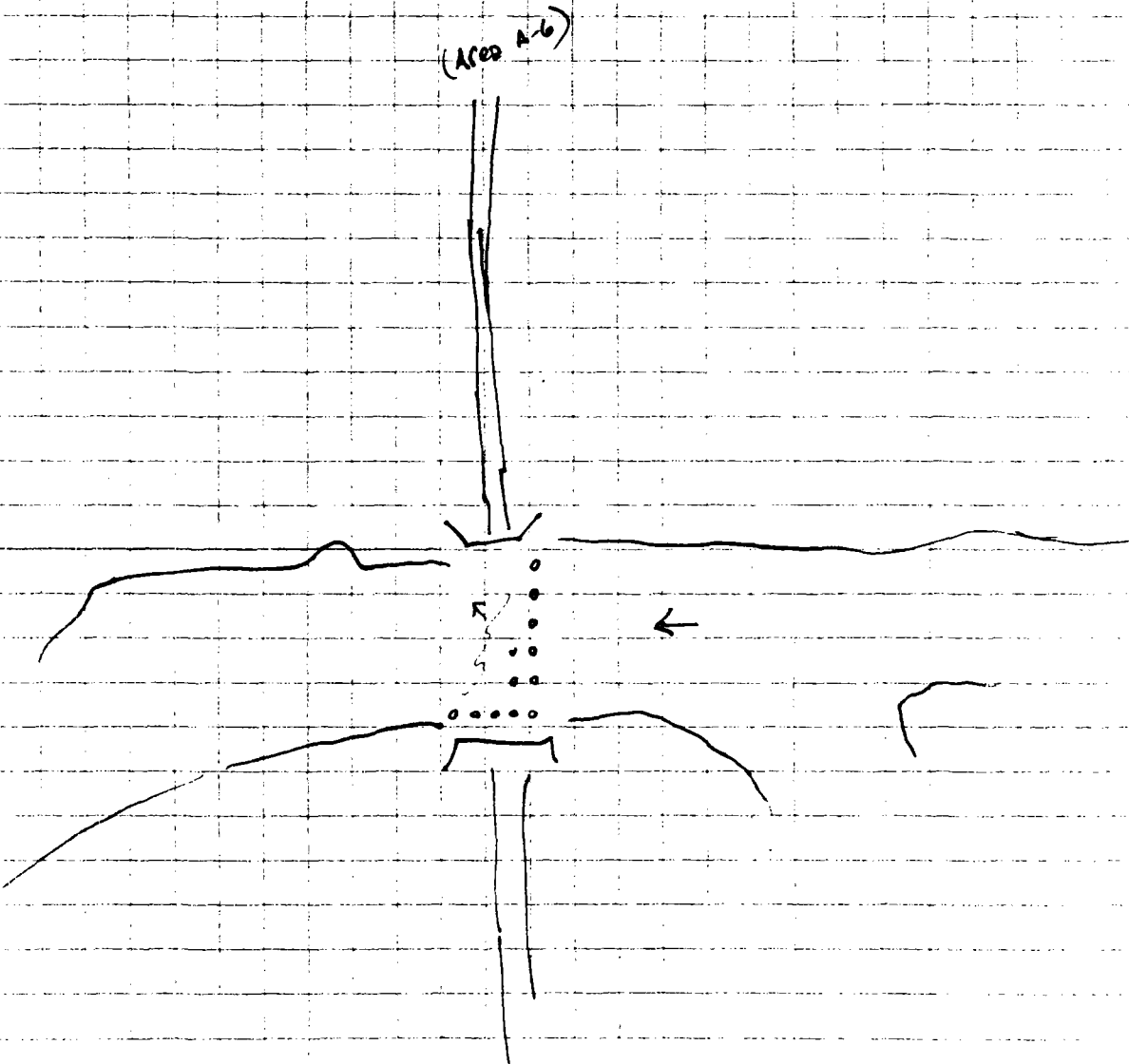
BY

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3/28/85

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#27 C/C BELOW 1ST DREDGE AREA





SUBJECT

SHEET

BY

DATE

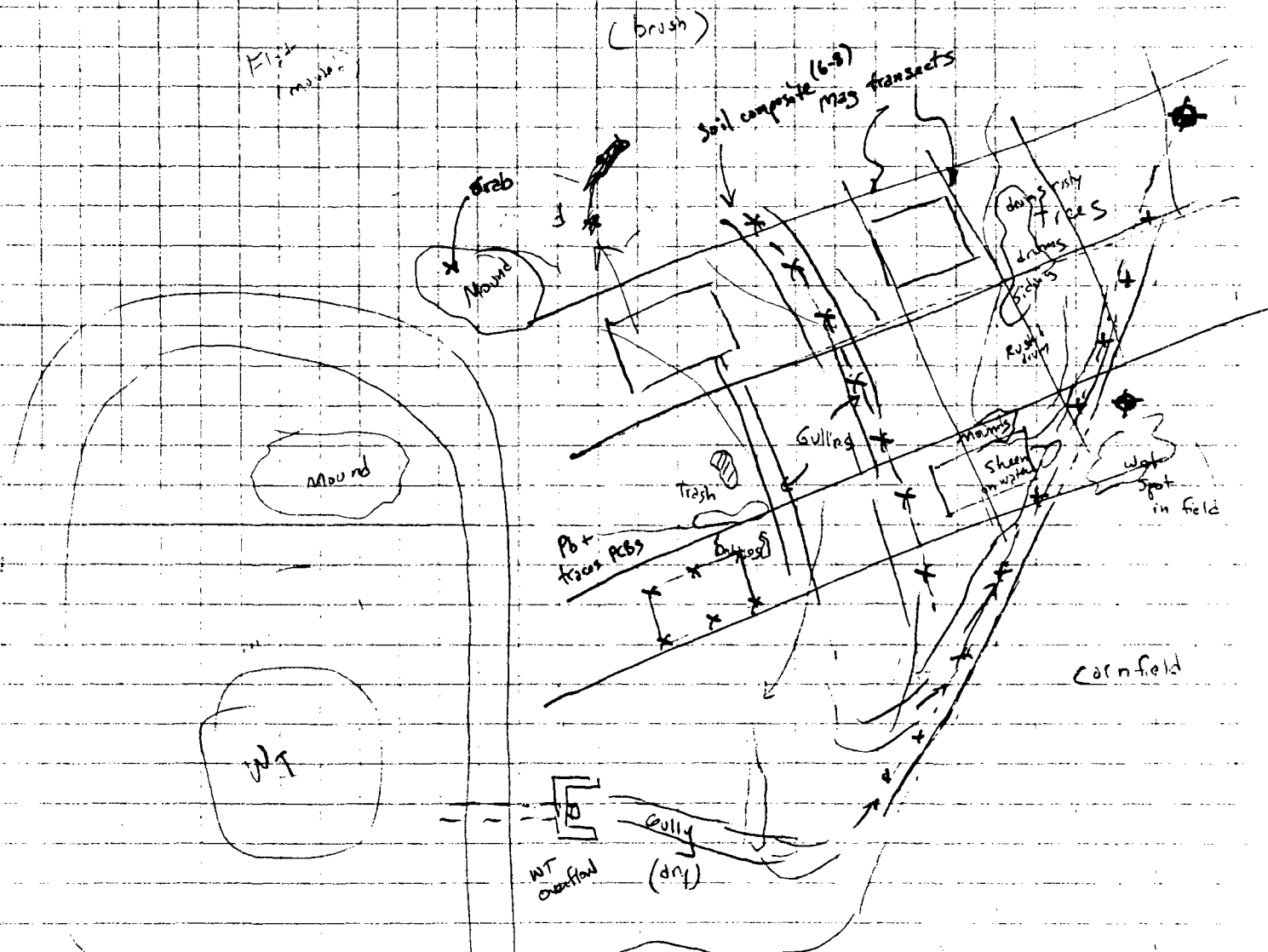
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19

3/27/85

#28 WATER TOWER LANDFILL
(bring 2 machete)

800 ppm Pb.



1. Magnetic Transects

2. 2 Wells

3. Soils: Main gully composite (8-10) — Surf + 1 ft compo.
Transverse gully composite (6-8)

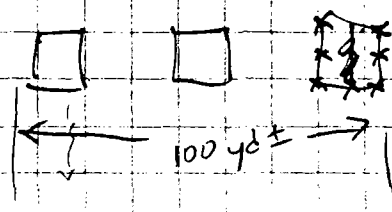
4 Rectangles w/ 6 samples each — Surf + 1 ft.
6 Grabs at discretion of geologist (1 in Mound)



O'BRIEN & GERE

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| | 18 | | 3/27/85 | |

#29 FIRE STATION LANDFILL



Strong
Metal pieces
ceramic
wire
So get down "Magnesium Powder"
→ car hornet

near elegreen
553 ppm Pb found

corner of refrig.

suspect fill area

3 humps w/
cement blocks

concrete blocks

swampy

shar in swamp

150 yd ±

Phase I

1) Magnetics

rober(?)

2) 4 boxes E slope
3 boxes N slope

7 composites of 12 grabs
(surf + 1 ft)

3. 4 walls

Olin dumped heavy here
Very hot fire once

- look out for Magnesium (ignites)



O'BRIEN & GERE

SUBJECT

SHEET

BY

DATE

JOB NO

20

3/28/85

#30 MUNITIONS CONTROL SITE

